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THE
NATURE-STUDY REVIEW

VOL. 14 JANUARY, 1918 No. 1

The Thirteen-Striped Spermophile, or Striped Gopher

E. LAWRENCE PALMER, Ph.D.
Professor in Biological Sciences, Iowa State Teachers' College

Any one who has lived in the prairie region of the middle west cannot help but be familiar with these animated ten pins. One does not need to spend hours in search of material for nature-study here for as he goes walking or riding through the prairie country these "now-you-see-me, now-you-don't" animals make up a conspicuous part of the landscape. With ears pressed close to the rounded head, with body erect and fore paws so small as to be inconspicuous, these animals stand perfectly stiff and rigid at the approach of any thing unfamiliar. There seems to be a dead line somewhere, however, because all of a sudden there is a sharp whistle and the approaching enemy sees only a scurrying brown form or nothing at all.

The writer had an excellent opportunity to observe these animals on the campus of the Iowa State Teachers' College at Cedar Falls, Iowa. Here, they manage to hold their own in spite of small boys who snare them, learned professors who poison them and a large coterie of cats which are protected by the ever present janitor who can see nothing of good in "just gophers." In spite of all of these handicaps, the campus has each year managed to boast a family or two of these interesting animals. Last summer, a family took up its headquarters under the sidewalk just outside my office. About two thousand people must have passed this animal home at least once or twice every school day of the summer term and yet but few stopped to acquaint themselves with any of the interesting habits of its occupants. Most of the people passed by without a thought, never noticing the round head with close cropped ears and bright eyes peeking at them from the edge of the concrete a few feet away. The animals became so tame that one could approach within ten feet without great difficulty and I have

seen groups of people pass by twenty feet away without alarming the animals sufficiently to scare them into their burrows.

These spermophiles remind an easterner very much of the chipmunk he used to chase through brush piles in the wood-lot. They are larger animals, however, and prefer a land covered with a good hard sod to the leaves and clutter of the forest floor. They are at least an inch and a half longer than their chipmunk relative and their habit of standing erect makes them appear much longer than the eleven inches which is their maximum length. Their backs are so characteristic that scientists have given the species the name of *tridecemlineatus* to signify the thirteen stripes which they bear. These stripes are not exactly continuous but consist of dirty yellow bands alternating with broader dark brown or chestnut bands, the darker bands being dotted by a row of light spots which tend to run together towards the head. The under parts are uniformly dull yellow brown, becoming white at the chin. The tail, which one remembers because of the animal's habit of giving it a defiant flip on disappearing into the burrow, is yellowish in the center and surrounded by a band of yellow tipped black hairs.

Along early in April, the first spermophiles appear on the campus but usually they are so few in number that they do not attract attention. We are told that the male deserts his family on the arrival of the young and it is certain that during May and early June there was little evidence that the burrow under the walk was inhabited. I had almost come to the conclusion that the campus cat had discovered the family but about the last week in June I discovered the mother and her young. I doubt if the mother had been confined to the burrow as much as my observations would indicate, but I know that I was unaware of the presence of the animals for some time. Cloudy weather is not favored by the gophers and, as we had this quite commonly, they were not out as much as one would have wished.

We are told by E. T. Seton that there are usually nine in a litter. I know that I have seen six young at one time and am not averse to believing that there may have been more. Life evidently begins in earnest for the young gophers as soon as they are able to see the world. Almost any time of day when the sun is shining we could see them out busily gathering up elm fruits and other foods. I remember one evening particularly when the little family was entertaining a bunch of students. The gophers are usually seen

only during the daytime but it had rained all that morning and it was not until late afternoon that the grass was dry. The work day apparently was being stretched to the limit because it was quite dusk before they ceased their activities. Unfortunately, these activities were being interfered with by students who were amusing themselves watching the heads pop in and out of the entrances to the burrows. Almost invariably, the old one would appear first to see if the coast was clear . If not scared, she would be followed by the others who came out of the hole each stopping just as he was about half way out to be convinced personally that the coast was clear On being satisfied as to his own safety, each would scurry off a few steps through the grass, stop and then go on a short distance. When all had gotten out and away from the hole someone would scare them and then the two-inch entrance to the burrow would certainly be busy for awhile. Hunger or excessive energy, however, could not keep all of this life underground long and within less than a minute by the watch, sometimes, the whole show would start again.

The food of these spermophiles has been the subject of quite a bit of investigation and, as is often the case, the first verdict which man pronounced against this wild thing was rather unjust. Bounties have been placed on them in different states because they were known to eat grain. They did and still do eat grain but Vernon Bailey in Bulletin 4 U. S. Dept. of Agr., 1893 and E. A. Beal in Bull. No. 6, Iowa Exp. Station, 1889 both come to the same conclusion that the grain destroyed is well paid for by the cutworms, grasshoppers and even mice which they destroy. Unfortunately, young birds are as acceptable as injurious forms of life. Wheat and other cultivated grains are taken as food but it has been found that seeds of bind-weed, wild sunflower and pigweed are also taken. It seems to be a rather remarkable fact that the animal matter in the food is eaten immediately and only plant matter or that which will not spoil is carried away to be laid up for use when food is not so abundant. Bailey showed this by pointing out that the cheek pouches usually contained plant matter while the stomachs contained food which could not be successfully stored. The striped spermophile is considered a quite successful fighter and apparently does not hesitate to attack and kill mice as well as smaller forms of animal life. At the hands of its enemies it shares no better fate itself for it is considered legitimate food by hawks, cats and other

animals of prey. Those which are fortunate enough to escape a violent death retire to their burrows sometime in September. They close the entrances of their home and retire for a rest of over half a year. In view of the fact that they are deprived of what is to some the most pleasant part of the year, it is little wonder that they must live an excessively active life while they can. The food which supports them during their period of greatest activity is largely injurious to man's interest. Aren't they entitled to a little wholesome grain to satisfy their hunger in the early spring when other food is scarce?

The little family which I had watched with so much pleasure was successfully broken up by the campus cat. I arrived one day just in time to see the last of the young ones caught as it came up out of its burrow to see if everything was safe. In looking up some references in connection with this article, I was glad to learn that these squirrels are often infected with internal parasites which are also parasitic and very often fatal to cats. If those which lived outside my window were so infected I feel that at least they did not live in vain. I only wish that they might have died early enough to save the myrtle warbler, the young rose-breasted grosbeak and a number of robins which I saw meet their fate at the claws of their common enemy.

An Animated Ten-pin

Animal Tracks

Robert W. Hegner
The University of Michigan

The suspicious nature of wild animals and their keen senses of sight, smell and hearing make it difficult under ordinary circumstances to study them in their native haunts. Everyone is familiar with the fact that a much larger number of birds are heard than are seen by bird students and that an approximate idea of the bird life of a locality can best be obtained by noting the number and kinds of bird songs as well as by observing the birds themselves. The fur-bearing quadrupeds (mammals) are even more difficult to find and since they do not sing and seldom make any sound at all some other method must be sought by means of which their numbers and kinds may be estimated. The solution of this problem lies in the study of animal tracks, and just as the songs of birds add to our enjoyment while in the fields and woods so the study of animal tracks contribute to the pleasure that we may derive from trips afield.

An animal track may be defined as the imprint of the foot of an animal in the snow or ground. When a number of tracks follow each other in succession they form what we may call a trail. Snow is by far the best medium for the making of animal tracks. Next in importance are wet sand, clay, and mud. The tracks are of course only temporary since the melting of the snow or an additional covering of snow sooner or later destroys or hides them. Tracks made in clay or mud last longer unless they are washed out by rain. Impressions made in light, dry snow may disappear in a few hours and like the daily newspaper must be read the day they are made if they are to be of any value. On the other hand, the tracks of a deer in wet snow may last for weeks or even months and are comparable to our weekly or monthly journals. The best time to study tracks is therefore in the winter after a fresh fall of snow. In the summer the banks of lakes, ponds or streams should be frequented especially after a rain, thus insuring fresh, clear tracks.

Signs are also of importance in determining the character of the fauna in any region since bear logs, blazed trees, beaver stumps, and the excrement of animals serve to indicate the presence of many species just as certainly as if the animals that made them had actually been seen. In fact a science has grown up from the study of animal excrement known as scatology.

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Fox Running
Rabbit
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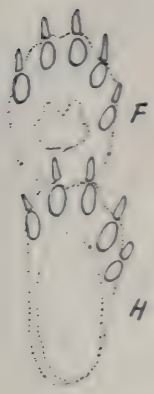
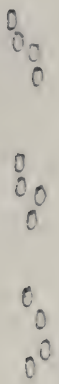
Elk Gallop
Virginia Deer
Doe
Fox
Squirrel



Mink



Mink Running

Porcupine
Walk

Porcupine
Run

Otter
Right Forefoot

Otter
Right Hindfoot

The identification of the track requires a knowledge of the size of the foot, kind of foot, methods of locomotion, and habits of the different species. Mammals may be divided into three groups according to their methods of walking. Most of the quadrupeds walk on their toes with the heel raised from the ground and are called digitigrade (Latin *digitus*, finger or toe + *gradi*, walk). Others like the bear and man walk on the whole sole of the foot with the heel touching the ground; mammals of this type are called plantigrade (Latin *planta*, sole + *gradi*, walk). The third group contains the hoofed animals like the horses and cattle. These mammals walk upon their hoofs and are called unguligrade (Latin *ungula*, hoof + *gradi*, walk). Many animals have feet that are similar in shape but differ in size; those of the weasel for example are about one inch in length whereas those of the wolverine are five inches long. If we know this and carry a ruler with us into the field the task of identification is not so great. If the medium is favorable each toe leaves its own imprint as well as each claw and we are thus enabled to learn how many toes the animal possessed, a fact of some importance since the number in different species is often different and the number may even differ on the front and hind feet of a single individual. The claw marks are indicators of the direction in which the animal was moving. The illustrations show the tracks of a few common species of mammals and indicate how distinctive they really are. These illustrations were copied from figures in Brunner's book on "Tracks and Tracking" with the permission of the Outing Co. It is extremely difficult, however, to distinguish between the tracks of certain species whose feet and methods of locomotion are similar, or between the males, females and young of a single species but difficulties of this sort are welcomed by the field naturalist since their solution is just so much more pleasant.

The tracks of a single individual differ according to the method of locomotion while they were being made. The three common methods are walking, trotting and galloping. This fact also adds to the problems involved in the study of this subject.

After the tracks have been identified we may go further in our explorations and attempt to discover what the individual that made the track was doing and what its mood was when the tracks were made. Long distances between the impressions indicate that the animal was moving rapidly. Speed most often indicates fear and

slower progress expresses caution. Anger is shown by marks on either side or behind caused by the waving of the tail and dislike when for example a fox hesitates to cross the trail made by a human being. These and many other facts may be learned by a study of animal tracks—a study that can be heartily recommended as being of extraordinary interest and one that will test to the fullest anyone's interpretative ability. The following references are to books and articles from which further information may be obtained.

1. Tracks and Tracking, by Josef Brunner, pp. XII + 219, 1909. Outing Publishing Company, New York.
2. Life Histories of Northern Animals, by E. T. Seton. 2 vols., 1909. C. Scribners' Sons, N. Y.
3. Reading the Snow, by R. S. Spears in *The Atlantic Monthly*, vol. 102, Dec., 1908, pp. 791–796.
4. Animal Stories Told by the Snow by Dugmore, A. R., in *Country Life in America*, vol. 5., Dec. 1903, pp. 117–121.

To The Deer Mouse

By William Prindle Alexander

Trim and lithesome, mite of fawn and white,
All fawn above and, purest white below,
A haunter of the bitter winter night
With great, soft eyes of jet that peek and peer,
And pinkish feet, that punctuate the snow
With hieroglyphics, tortuous and queer,—
Four pinkish feet, together with a tail
That scrawl his name where e'er he leaves his trail.

His shell-like ears must needs be very keen
When he by night would sport about and prowl
Beneath the snow-beladened evergreen:
In the nocturnal stillness of the wood
There lurks perchance some burly, bogy owl
That fain would sup, and find him very good;
But our pert mousie hies him from his nest,
With nimble feet and wondrous hearing blest.

Somewhere his home with nuts is amply stored
And snug it is with fur and fiber lined,
A tree his citadel, and he the lord
Chirps loud and clear, as though his heart would sing
A song, defying cold, and winter wind,
With no small cheer, until returning Spring
Shall bid him welcome to the wildwood gloam,
A wee, glad mouse, secure and free to roam.

Flying Squirrel

Mercury

WILLIAM TRELEASE
Professor of Botany, University of Illinois

It was a May afternoon. I had been watching the bees on the huckleberry bells. As I loitered home from the woods, I ran across the boy in the case: a boy of ten, who had never before spent a spring in the real country. To-day he was standing by the bars of a rail fence with another boy, a few years older than he, apparently thinking of nothing out of the ordinary. As I came up and spoke to them while getting through the fence he said, quite casually, "Papa, I've got a surprise for you at the house." The story of Sputs, the red squirrel, was fresh in my mind (but that's another story)—and, thinking that I understood, I said that we would go right up and look at it. "It's the bestest surprise on Earth," he added, and I knew that I didn't understand.

So I was introduced to Mercury, young but full grown and too little accustomed to our crude ways to be handled without gloves. And so he continued for three weeks and I had begun to think that I should never establish relations with him, until one day he came down from the portiere rod to get a nut out of my hand and I found that though he scolded and bit, he no longer bit to hurt, but tugged and scratched and mouthed a finger as a kitten does a hand.

Neither the city boy nor the country boy had ever seen this shy little type of body before: the one, because it lives in the woods; the other because it is abroad at night and sleeps through the day when it can. The story of the discovery was an interesting one. Boylike, they had kicked against a dead birch stub; the older boy had seen a dry leaf float away from it, and the younger boy had said that that sort of leaf must be a flying squirrel though he had never seen one before.

How for a time Mercury lived in a gauze-covered fish globe! how he traveled a thousand miles in a pint jar with perfection top, carried in a coat pocket, taking his outing in the sleeper to the terror of the porter; and how he came to own a coat room and to shake down his bed where he pleased—in pocket, hat or bonnet; these are chapters that do not need to be written. But it is different with his daytime doings, for then his home was a side pocket of my coat, and his chair at dinner the handkerchief pocket of the same coat, out of which he put his little arms and gracefully ate

what was given him. And for a whole semester he assisted in a laboratory, sometimes in one and sometimes in the other of his pockets, making the transit so tactfully that never a pair of eyes except my own saw him until one day,—searching in my pocket for some acorns for a demonstration, forgetful of him, I woke him from a nap to the belief that his storehouse was being robbed: No class could be expected to be oblivious to the alarmclock protest that issued from the pocket under those circumstances, nor to the whiskers, the bead-like eyes, and the little round ears that came into evidence at the mouth of the pocket. And in this way Mercury came into recognition as a regular attendant at a great University,—always mannerly except once when he found a senate meeting tiresome and had to be taken to the bur oak trees for consolations.

Have you admired the graceful little adjuncts chained to the subjects of Copley's portraits? Mercury never wore a chain. Yet I've not doubt that he would have been happier in a squirrel way if he had never left the woods.

Is such a surprise worth a trip to the woods—many trips to the woods—carefully planned trips to the woods?

"A flying squirrel's nest and young on Emerson's hatchet path, south of Walden, on hilltop, in a covered hollow in a small old stump, covered with fallen leaves and a portion of the stump; nest apparently of dry grass. Saw three young run out after the mother and up a slender oak. The young half-grown, very tender looking and weak-tailed, yet one climbed quite to the top of the oak twenty-five feet high, though feebly, claws must be very sharp and early developed. The mother rested quite near, on a small projecting stub big as a pipe-stem, curled crosswise on it. They have a more rounded head and snout than our other squirrels. The young in danger of being picked off by hawks."—*Thoreau's Journal.*

The Odoriferous Skunk

By William E. Ringle

Professor of Nature-Study, Kansas State Manual Training Normal

Should one wish to engage in a novel business that offers reasonably good returns, one would do well to consider the advantages of skunk farming. There is always a market for the animal's beautifully marked fur. Furthermore, some experimenters have been so bold as to report that its flesh is sweet and tender. But buyers of meats have their prejudices.

There are a few skunk farms in New England. Maine probably sends more skunk furs to market than any other state, its annual fall and winter output being between 100,000 and 200,000 furs. After they are dressed at Philadelphia, many of them are shipped to Paris, where they are sold to the dainty Parisienne as "monkey skins." When they are offered to the retail trade in this country, the buyers are frequently assured they are getting Alaska sable. The sum paid annually to trappers for the furs is estimated at $3,000,000. These men gain a further revenue by selling the skunk's bodies, for the bodies yield an oil that is used in making certain liniments.

The beauty of the fur lies in its contrasts of glossy black and clear white. The white bands and spots are variously arranged but the commonest arrangement is a frontal stripe and two broad stripes on the sides of the back. Because of its fur, the animal is very conspicuous when it ventures forth by day.

There are few farmer boys who have not known the excitement of trapping and hunting skunks. It is a winter enterprise which the prospective possession of a few dollars of spending money makes very attractive.

The trapping of one skunk is usually evidence of the proximity of a whole den of the odorous animals. It is the digging out of this den that occasions the excitement. All the dogs on the farm and usually the neighbor's dogs as well, are rallied to the work. The boys put on their old clothes and rally forth, club in hand.

The scene at the burrow is better imagined than described. There are plenty of opportunities for genuine daring. If the dogs cannot reach the skunks, the boys must punch them out with long sticks. The operation is carried on in an atmosphere that is stiflingly perfumed. And the intrepid youths are indeed fortunate

if they are not struck by a liquid volley from the skunk's artillery. The dogs are usually as plucky and stoical as the boys.

Inetrment of Clothes

Such an expedition is apt to yield four or five skunk furs. But it is also apt to be followed by the burial of old coats and trousers and by the boys being forbidden to appear at table for several meals.

More than one rural swain while on his way to visit his "best girl" has met a skunk and been obliged to return home sorrowing. More than one jauntily clad young man from the city, espying a skunk for the first time, has drawn near to ascertain what manner of beast it was and has repented in solitude.

The skunk is unique in its means of defense. Its almost overwhelmingly fetid discharge is dreaded alike by men and animals. Yet the liquid that is so malodorous is innocent in appearance, being of a clear amber. The skunk can throw that liquid for a distance of fifteen feet and its acrid odor is perceptible for more than a mile. Clothing defiled by it can never, as a rule, be wholly purified.

The skunk is always ready against sudden attack. Nor is it true, as some believe, that one discharge prevents an immediate repetition. Moreover, one would be foolhardy to put to the test the statement that is sometimes made that holding the animal by the tail prevents the discharge. The liquid is not, however, dangerous to the eyesight, as one sometimes hears.

One authority gravely makes this recommendation: "The best method of dispatching a skunk in a steel trap so as not to defile the fur with the odor is to approach near enough to strike the animal a quick blow across the back, thus paralyzing the hind parts and preventing the discharge." This may be good enough advice but it sounds suspiciously like that to the effect that the best way to catch certain birds is to put salt on their tails.

A person who has served as a target for a skunk may get rid of the odor by washing the affected areas of the skin with chloride of lime or gasoline. The best means of cleansing garments is to wash them in gasoline or benzine, then expose them to the sun and wind.

But the skunk's unpleasant trick of tainting the air has brought him into an ill repute he does not deserve. People forget he

employs it for self-protection only, never by way of aggression. The fact is, he is a valuable animal and merits consideration.

Every farmer ought to keep at least one skunk. His granaries and barns would not be infested then by rats and mice. The large loss these rodents cause would be wholly stopped, for they have no more relentless enemy than the skunk. If the skunk chances to take up its abode in a barn, it will, if not disturbed, remain there until every rat and mouse is devoured.

Nor does this mean that the barn will be pervaded meantime by the animal's odor. In all probability, its presence will never be perceptible to the nostrils. It will rarely be seen, for that matter, for it sleeps through the day and gains its food by night.

If the farmer should object to having a stray skunk about, it is entirely practicable for him to take and tame the young ones of a litter. They make pretty pets, are cleanly in their habits, and do not emit their stench unless provoked.

Chooses Diet of Rats and Mice

But its liking for a diet of rats and mice only begins to tell the worth of the skunk to the farmer. It preys upon a number of other pests that trouble him the most. Grasshoppers, beetles and their larvæ, the white grubs that in so many parts of the country destroy lawns and meadows, tomato worms, tobacco worms, ground squirrels and pocket gophers, are staples on his bill of fare. The army worm knows no worse enemy. When grasshoppers are abundant, it makes them its chief food. Other things the skunk likes to eat, but which do not concern the farmer so much, are reptiles, crickets, earthworms, crayfish and centipedes.

It is true that the skunk sometimes feasts on chicken. But minks and weasels are generally to blame for that which is laid at the door of the skunk. They only suck the blood of their victims. Then the skunk happens along, begins to feed on the flesh, and is caught in the act by the owner of the hen roost. The common skunk cannot climb a roost and most members of the species do not know the taste of chicken flesh. But in instances to the contrary, "the skunk," according to one observer, "more than balances his debt for corn and chickens by his destruction of obnoxious vermin."

The word "skunk" is a contraction of "seganku," which was the name the Indians gave the animal. The skunk is a member of the weasel family and is found in North America only, although there

is a somewhat similar animal, called the "zoril," in South Africa, and another in Egypt. Ten species of the skunk have been distinguished. It is a misnomer to call it a polecat, for the real polecat is an European animal resembling the ferret and preying on poultry.

There are from five to seven skunks in a litter, which, in the northern states, is born in May. The family remains together for about a year. Through the severest months it hibernates in its burrow. Two or three families often live together, it seems, for as many as twenty skunks have been taken from one burrow.

The dens are sometimes of the skunks' own making and sometimes those abandoned by other animals. Skunks often excavate dens in ordinary soil, but if they can find a natural cavity among the rocks, they promptly take possession. They sometimes make their abode under houses or even in a house in some obscure nook, being attracted by the warmth of the building.

In summer the skunk leaves its burrow at sunset and busies itself catching grasshoppers and beetles until dark. Then it is obliged to rely upon its senses of smell and hearing to locate its prey. These are so keen it can detect beetles and larvæ in the soil.

The skunk itself is the most silent of animals. The only sound naturalists have heard it make is a low, impatient grunting, which has been compared to the sound produced by beating one's hands with a whisk broom.

Take Frequent Baths

Skunks are frequent bathers, but they always prefer shallow water. They never swim unless obliged to. One marked trait of this much abused little animal is its almost feminine curiosity. This curiosity frequently leads it into predicaments that would mean death for any creature less well equipped defensively. And, despite its enemy, man, it is unsuspecting and lacking in cunning. This accounts for the large number trapped. Since it is practically immune from the attacks of other animals, it leads a comparatively easy life, moves about in a leisurely manner and, like many men, takes on fat and loses its agility when the heyday of youth is past.

The baby elephant is ringing the bell for dinner

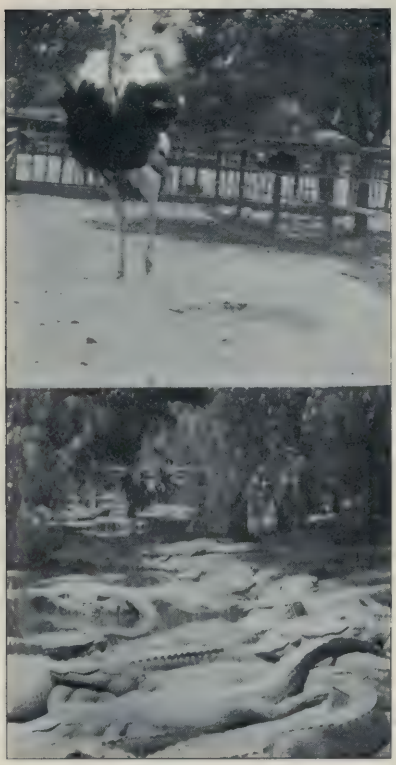
A Trip to the Zoo

Fortunately for the relaxation of our tense race, a circus occasionally comes to town. The grown-ups must take the children to see the animals. So there is a day of jollification for both big and little, as they laugh at the pranks of the monkey or feed peanuts to the elephants. But there is always a many ringed circus, that calls us all too soon from these most interesting creatures.

More fortunate is the city possessing a large Zoo, where as far as possible, the animals live, as in their natural haunts, rearing their young. Most fortunate of all is the adult, who can go with the kiddies day after day to such a zoo.

It is the aim of Dr. C. L. Edwards, Nature-Study Director of the Los Angeles City Schools, to give each of the one hundred fifty-two schools of the city, an opportunity for a day with the Zoo animals. Including the third through the eighth grades, a group of twenty representatives, of those most interested in Nature-Study is chosen. One of the assistant supervisors has charge of these for the day. Off with their lunches, it is a happy group that boards the street car.

A most happy condition exists in our city, for, within two blocks are found the entrances to the Ostrich, Alligator and Selig Animal Farms; while across the street is a City Park. The two former ones are visited in the forenoon, the lunch hour spent in the park and the afternoon in the Zoo.



The male ostrich and nest in sand
Alligators sunning themselves

The life history of the Ostrich becomes real; when the individual child can hold the heavy egg containing about the contents of three and a half dozens of hens' eggs; when he can see the growing chick breaking the shell in the incubator; when he can watch the ostriches from the one day old baby to adult birds over forty years of age.

Here begins one of the studies that will be carried through the day's lesson—that of protective coloring. It is nowhere shown more plainly than in the down on the chick's back. This resembles a tuft of dried grass, rendering the maternally unprotected young ostriches almost unperceivable to enemies. In the adult, too, as the female sits on her eggs during the cooler hours of the day, the drab blends with the coloring of her desert surroundings; while the black plumage of the male, incubating at night is his protection.

Not only the habits of eating, fighting and nesting, but the commercial value of the bird is considered. The child learns why there is a difference between wearing bird wings and ostrich plumes on a hat. He sees the stubs of the quills, where the wing plumes have been cut shortly before moulting time—never pulled, and thus injuring the bird.

The attendant rides astride and drives a mature bird, showing the great strength of the legs for running, since the wings are undeveloped for flight.

It is a draw which is the more fascinating to the children, the Ostrich or the Alligator Farms. In the latter the reptiles are compared with the big birds. Here is another life history study, from

the egg in the slow process of incubation in decaying vegetation, to the sluggish monsters of two hundred years of age.

In alcohol, there are different stages of the embryo of the alligator showing its relation to the bird. Here the scales on the ostrich legs are recalled. The mode of life, lung breathing, long hibernation under water, inactivity on land, canabalistic tendency and fighting characteristics are all too interesting to be easily forgotten by the child. Here also, the practical side is touched upon in the use of the tanned hides.

This intensified study of the life histories is a fitting introduction to the Zoo, where the study of protective coloring is continued and the work of classification begun.

With spread arms the giraffe bends to reach the child's hand
The deer with antlers in velvet
The camel with her two weeks' old baby

We first visit the curious giraffe—curious in form and in mind. In their silent way, they show their interest in the children by always coming to meet them. According to the keeper, after the hoisting near, of a large American flag, one of the giraffes kept so closely watching the floating emblem, he did not eat for two days.

The spotted body of the giraffe, with the long neck and legs, affords an excellent example of protection and adaptation in Nature. The two fingers and two toes with wrist and heel raised

far from the ground, the knoblike horns and lack of incisors on the upper jaw, place these elongated animals in the cattle family.

As we pass on, the class observe the other animals belonging to this cattle group, the deer, wapiti sacred cattle, llamas and camels with special adaptations for their varied modes of life.

The several species of deer and the wapiti give a review of our lessons in school on the deer tribe. We have found them in all stages; the adult male with his branched antlers, then in the process of moulting, and later the velvet stages of growth of the new antlers. The spotted fawn, from a day old to a yearling, has completed the life story of the deer family.

The comparison of the camel of Asia and the dromedary of Africa with their habits and use, affords interesting study. Many children have been positive of the seven stomachs of the camel. Where do some texts get the extra four? One so-called stomach is a pouch for carrying the food, until the animal at leisure, regurgitates it for grinding, whence it goes direct to the digesting stomach. The third has a pitted wall in which the water is carried, each pit being covered with a thin membrane to retain the water.

In the dog family there are several breeds including the Eskimo dog. The coyote and wolf are compared with the domesticated varieties and then we understand the origin of the latter. Both wild and tame species in this family give evidence of close relationship in their bark, general movements and structure of limbs.

The elephants are so attractive we linger with the huge creatures as long as we have a peanut left; for that trunk with its forty thousand muscles stretches out so pleadingly. But it behooves us not to keep him waiting too long, else his prolonged upper lip and nose bend back into his mouth only to be extended with a shower bath for his ungenerous visitors.

We pause to watch the bears as they roll in the sprinkling water or wash their hands in the basin near by, but only long enough to see their clumsy efforts at walking and note the reason why. These are the first animals we have found walking upon the palm of the hand and sole of the foot.

But hurry on we must, for the monkey gibberish is calling loudly for the wares in the bulging pockets approaching. Here the prolonged laughter begins, and who can say it isn't time well spent laughing at the antics of these peculiar woodland dwellers. There are monkeys of all species from the Ringtails, the Cebus and

Spiders, of the New World, to the Rhesus, Mandrils and Hanumans of the Old World.

Nothing but the roaring from the lions and tigers could drag away the class. The smell of meat has set the big cats raging, as their feeding hour approaches. The cat family is represented by some thirty members from the New and Old World. We compare the American Mountain Lion or puma with the Asiatic and African lions and the jaguar with the leopards. The general characteristics of the fireside tabby are traced in the cushion-like pads on the five fingers and four toes, the crouching habit, the fondness for petting and in the loud miau. We have found the ancestors of our domestic cat, the Egyptians being the first to make them hearthside pets.

Mother's darling
The emu, resting
Getting acquainted Stanley Cranes of Africa

But of all the wonderful birds seen, we have said nothing, the graceful dancing cranes, exquisite pheasants, parrots, eagles, hawks, ducks and geese; but we have taken note of these. A closer comparative study is made of the American ostrich or rhea and the Australian ostrich or emu with the big African one. We

invariably find some resting, showing that, while only the toes are used in walking, the whole foot is used in sitting.

In talking about limb structure, the kangaroo is most helpful. When walking slowly, he uses the entire foot, his short arms aiding in his leap frog like jump; but in rapid running he steps on only the toes, making an upright posture.

The greatest delight of the Zoo is the babies whether completing the circle in the cattle, cat, dog or monkey families. There have been the young of many species, ranging from a day to a year old. Two little tigers, deserted by their caged mother, were adopted by a big boarhound, the mother of only ten in her own brood. We were happy that one fought the fight for life and won. The care and devotion, shown by most of the wild mothers, are beautiful to see, and lasting impressions of the wonder of life cannot be erased.

So we go home with a better understanding of and broader sympathy for the wild life. Teasing is absolutely prohibited, and the only offenders of the law had to be shut up, those beautiful African cranes that followed the children about to pick at their toes.

At three-thirty, the tired but happy children take the car, to live the Zoo trip over again on the morrow, as they tell their experiences to the classmates remaining at school.

The Winter Sleepers

EDITHA S. CAMPBELL
Erie, Pa.

While the snow comes drifting down spreading a blanket of white over the bare brown earth, our footsteps are hushed, the very air is still, except when the wild wind blows. But why this warm blanket and quiet? It is Mother Nature's sleeping time for many of her children.

It was not always thus. Away back in the dim past of our world's life history, from the animals point of view, the world was a much better place to live in. The climate was mild, the vegetation luxuriant, there was always something to eat.

The early, early rodent ancestors of our Chipmunks and Squirrels had no need of a furry coat. But some day a slight chill came into the air, and gradually oh! so gradually, covering eons of time, that

chill grew and entering its descendants' bodies, the Great-Guiding Force slowly, oh! so slowly provided, as the chill grew, a furry coat and a broader tail, until when the Great-Ice Age came, our little friends were prepared; and those of their relatives who did not care to meet the chilling blasts moved South, coming back only as the ages passed and the great ice sheet receded and once more the balmy air of the tropics prevailed. As we come down the ages the light-coated relatives migrated three times, while our furry friends who had lingered on the edge of the ice-sheet adapted themselves gradually to the chill and temperate warmth until now they stay with us when the summer sun shines and winter winds blow.

The ancestors of our orchestral insects never having adapted themselves to those cold ages, stayed in the tropics and the temperate climates of the old later Tertiary and now when the cold is only of a few months' duration and the feeding grounds are bare what better gradual adaptation than just to sleep during that time tucked away under the blanket of a clod of earth or a bunch of leaves?

The flowers have finished their life work, their seeds are nestled either at home or on foreign ground. With no nectar to sip, the Butterflies are gone or have hidden away and fallen asleep. The Moths' "youth" children are quiescent for the winter in their marvellous home, undergoing the most wonderful change in all the creative changes of life.

The table of delectable eating is bare for the snakes, the frogs, the woodchucks, and so many more, that in their warm winter homes they must sleep that sleep that the law of adaptation has provided.

The bumble-bees have given up their lives leaving only their young queens for the long winter sleep, while the honey-bee workers are resting in their hives and feeding upon their stores of honey.

So the buds and seeds wrapped in their blankets and tucked in their cradles are waiting for the warm sunshine of spring to begin their work of beauty and service.

So as the night brings the quiet for our slumbers, now is the time of the year when our thoughts are uplifted by the sleeping wonders about us.

The Snake: An Animal Deserving Class-Room Study

By Gayne T. K. Norton

How much, if any, of the lamentably small portion of time given over to classroom nature-study is devoted to herpetology I do not presume to know; but, judging from more than two dozen educational journals which reach my table monthly, I should say it was almost nil. I ask the question: Why?

My present deep interest in reptiles and amphibians is comparatively few years old. Until my proper introduction, I, in common with I venture to say 95 out of 100 people, killed, or avoided in a state of semi-terror, every snake chanced upon. A girl of twelve made me familiar with a few of the most interesting snake facts and I held a snake in my hand for the first time. A mental house-cleaning and readjustment ensued. Innate repugnance was partly overcome by study.

I dug hard; I forced myself to handle and catch, and become acquainted with, every specimen I could find—and you have my word for it, the reptile house in the New York Zoological Park is a fertile place for such study—until my fear turned to respect. I realized that there were thousands of injurious animals still alive because of the few dozen snakes I had killed. I found what has proven to be, to me, the most interesting of all Nature's life-phases. I write much of my interest; I talk it constantly, observing the effects. Thus, my interest and observation prompt the question. In all the magazines I see, besides all the reviews and files examined, the snake seldom appears in any guise; never have I seen it mentioned as appearing in the school-room—not only an added reason for its classroom debut, but a proof of the greater necessity thereof. Various individuals and organizations, including the Government, are putting forward snake-conservation propaganda with seemingly small effect. Would not the best method be, and there is economic need for a method, to stop, or diminish, the killing by child instruction?

Almost every bit of Nature that can be brought into a classroom, and much that can not, has been, is being, or will be studied by pupils of all ages. No matter what branch of natural history receives attention the study is decidedly worth while and the time spent well expended, but, dare I say that 25 per cent. of the specimens receiving consideration are of less actual value to child and community than snakes? The snake deserves a much higher

ranking than is granted it even by teachers. It has many advantages for classroom study completely lacking in other live things.

I shall not touch upon the snake as an economically valuable animal directly; reasons for conserving this "emotionally neutral or unfriendly helper of man" are certainly sufficiently understood; they do not need re-statement here; nor shall I, for the sake of giving, mention life-histories. I wish to deal only with the snake from the classroom, nature-study period standpoint.

The age at which children might begin this study is a matter to be determined by the teacher; experience and present classes should be indicators. It might be wise to inform parents of the proposed study; this should be done with tact, emphasizing the perfect safety strongly, then urging the necessity. The earlier the age at which the child "learns" the snake, the more snakes will be spared. Incidentally, children talk of their school work, such a "horror" topic would receive more than the usual mouth-to-mouth advertising; conservation would be carried on in this way, and education spread. Then, too, the quicker a child can recognize a venomous reptile on sight, the better; but statistics show the poison danger to be inconsiderable. There are other advantages in early study also, but they hardly need recounting. Here, as in other branches of organized nature-study, grading would be used and of course a single specimen would do for all grades.

It is not proposed to bring a venomous snake into the classroom for study. But the study of the Elapine and Crotaline snakes, the two families to which the seventeen species of poisonous snakes found in the United States belong, should be studied, by comparison, early. This feature and the economic value are of equal importance, for in many communities, New York city for example, the presence of dangerous snakes in the near-surrounding country, often popular picnic grounds, is not suspected. In the little snake instruction I have attempted (solely to adults) I always treated: "How to know the dangerous snakes, "first. But this is up to the teacher, besides geographical location may dictate a policy; it is out of my domain to suggest a course; I trust I have not already treaded upon any toes.

Now that it has been decided (?) to give the snake its turn in the classroom, the first consideration is a cage. A simple box of smoothed, half inch boards 9 x 9 x 30 inches (a boy with a couple of soap boxes should do the trick) will suffice, providing it has a

close-fitting glass front that may be easily raised or lowered. The cage needs no fittings save a small, shallow water dish. A little testing will show at what part of the room the best light will be had on the interior with the lowered glass. But it need not remain absolutely stationary. A strong light is not necessary. Sunlight will be appreciated by the snake. Temperature should be as even as possible; precautions should be taken to safe-guard the snake against extreme cold, though it will survive successfully a rather wide temperature range.

It goes without saying that the cage should be cleaned daily. This is not a long, arduous or unpleasant task, in fact, the teacher may turn it to his, or her, advantage: The chances are that timidity will be felt by some of the pupils at first; however, a "courageous" boy will not only be glad of a chance to become a "hero" and so accomplish the desired end, but his action will help other pupils to overcome their fears. Later, some sort of a Johnnie's-turn-today-and-Willie's-turn-tomorrow system may be devised. The snake will not suffer by the Saturday and Sunday closing. Fresh water should be supplied daily, the usual amount increased each Friday evening.

Feeding may present the only problem, but this is unlikely. It is most probable that snakes kept for such purposes will readily eat and do well in captivity. The specimen will take food twice or three times a week; Monday, Wednesday and Friday it may be offered. The engulfing process will be found most interesting and instructive. At first the feeding had best be done early or late, without an audience until the new home is adopted. Small rodents, toads and frogs will make an excellent diet for almost any snake, but they must be offered alive. The boy snake-food-catcher is sure to be another "hero." Here another natural history topic seldom met with in schools is brought to the front. It will be seen, and can be pointedly explained, why certain animals (rodents) are pests and why the snake is a friend by his eating them. Should the specimen refuse food it will do well for an indefinite period anyway. After snake acquaintance is made through the first specimen, very likely it will be changed for one of another species, and so on as long as the neighborhood species hold out.

Almost any variety of snake, with the exception of the species of the two families mentioned, will serve as captive specimens for study equally well. If possible a snake with strong or unique

habits or characteristics—though all are really such—may be a trifle better, for interest may be more quickly aroused. For examples: the king is immune to Crotaline poison; the pine, and others of course, is very valuable economically; the indigo, or gopher, is beautiful and an even better "pet" than the king; the hog-nose, snakes, often called and mistaken for some imaginary species of deadly "adder," have a habit of play-possum; the milk, that never had anything to do with such a drink; or one of the "faker" snakes that "mimic" the marking and coloration of the Elaps. But these points, if not already known, may be gleaned with a few hours reading. The Reptile Book, by R. L. Ditmars, is an excellent authority. If none of the above species seem available and only "black" and "garter" snakes are seen, select one of the latter. The "garters" are more satisfactory in captivity. The "black" *may* act disagreeable.

Perhaps some readers have been asking: "But how are the specimens to be procured?" Well, they might be purchased, though in any but an extremely congested center this is unnecessary. Even at that, right among us there are often snakes. Central Park, in New York City, has its quota of perfectly good "wild" snakes. It would be much better, cheaper and more exciting to collect and "tame" your own specimens.

Go into a field, thicket or woods on a bright day and there you will find him, sunbathing, investigating the dried-up brook bottom, on a log in the swamp or a bush at its side, among the clover, by the brook, drinking perhaps, almost anywhere in pursuit of a toad, or at the foot of a bush. But you must see with the eyes of a sea-gull, unless the surprise is mutual, and tread so quietly that the cricket by the path will not stop his fiddling (I have been able to do this but twice out of many trials). I think of nothing more exciting than looking for snakes. And how many more there are than we had supposed!

You surely can recognize the dangerous snakes, if there are any in your "hunting ground." By the way, what is the dangerous snake nearest you? If you can not recognize them, I'd wait until I'd learned.

The innocuous snakes can be taken with perfect safety with the hands, providing you can approach near enough. But if dubious, heavy boots and leggins with thick clothes and gloves may be worn, while a long-handled, short-forked stick (for pinning the

reptile to the ground) can be carried—a good idea for so untimely escape is prevented—or even a pole with a noose. Then you may further encumber yourself with a gun of some description, specimen bags and the cage, and so hinder your movements and reduce the chances for a capture. But no matter what the garments or equipment, no fun will be poked if it be known you are going snake hunting. I know!

If any are interested in the ideas suggested and would care to correspond, I should be pleased to give any further general or specific information wished within my power. I am quite sure any questions asked will be answered, for the reptile curator of the New York Zoological Society is interested in this phase of snake-education and will, if need be, gladly assist me.

Snakes soon adapt themselves to confinement, though they will probably resent capture, and can be handled with perfect safety. They will appreciate, or seem to, *careful* aid during the skinning process. Handling, except right after food has been taken, will enliven them.

The Little Brown Creeper

Altho I'm a bird, I give you my word,
That seldom you'll know me to fly.
For I have a notion about locomotion,
The Little Brown Creeper am I.
Dear little Brown Creeper am I.

Beginning below, I search as I go
The trunk and the limb of a tree
For a fly or a slug or a beetle or bug,
They're better than candy for me,
Far better than candy for me.

When people are nigh, I am apt to be shy,
And say to myself, "I will hide."
Continue my creeping by carefully keeping
Away on the opposite side.

Yet sometimes I peek, while I play hide and seek,
If you're nice, I shall wish to see you,
I'll make a faint sound and come quite around,
And creep like a mouse—in full view,
Very much like a mouse—to your view.

(Author not known.)

An Animal Oddity

HOWARD C. BROWN
Pres. Califor Naturalist Club, Charles City, Iowa

There are a great many queer combinations among animals. Indeed it seems as though we have only to suggest some visionary form, and we find it represented by some living creature. No, we need not even go back to past ages. We have them in the modern age,—the tapir, the elephant, the giraffe, the quagga, etc. But by means of zoological parks, and circuses these creatures have been displayed to many, and their habits learned. This is all necessary, but I fear that in the study of these animals we have quite forgotten and neglected the American animals some of which may be just as odd, and whose habits may even prove more interesting, because they are American.

Did you ever stop to think of the possibilities of an American zoo? I have read of an insect zoo, but did you ever hear of a zoo of mice, rats, bats, lizards, etc.? Strange as it may seem a great many people neglect the members of the animal kingdom, but above all, it seems to me that bats are some of the least understood animals of America. And by least understood I mean that fewer people know their habits, species, and food than those of any other animal. Now of course, when we consider the many microscopic animals, this is not true; but let us pass by them, and get to the animals according to popular belief in a truer sense.

I heard of a gentlemen who once had a bat as a pet, and I heard of some of the things he discovered concerning it. Sometime ago, however, I was presented with a live bat, given me for a specimen. He was a beautiful little fellow, with a grey back, and chattering pearly teeth; and I fear, thought this world's hands were too rough for so delicate a creature.

I regarded this as a rare opportunity, and determined to keep my bat alive to note his habits. The next day I transferred him into a better home and placing a fly on the end of a stick, I held it toward him. He chattered, and shook his head, giving me a warning by his terrible threats. And why shouldn't he? For, man who had taken his freedom, was his greatest enemy. He shook and quivered when he heard a human voice. Finally after several trials he grabbed the fly from the stick, and in an up and down motion of his head, swallowed it.

Gradually he became accustomed to my hand, until finally I was able to stroke him lightly, without his showing any fear. He gained confidence in me, and when he heard my call, he would clamber down the sides of the box, and come to meet my stick. For one meal, he ate twenty-five flies.

I tried feeding him meat, and various other foods but he ate, to my knowledge, nothing but flies and one mayfly. The latter, it took him sometime to devour, and the process was accompanied with the usual nodding of the head. As he ate, you could see his sharp teeth cutting the food. He seemed to prefer live flies, but he ate them even after the rigor mortis had set in. He seemed to enjoy being stroked carefully. But he was so quick, before I realized what he was doing, he would clamber down the sides of the box and be pushing his head up on the other side. His walk was not particularly slow, and when he drank, he climbed up over the pan.

I found out a great deal about him, but my pet died all too soon. I suppose the lack of exercise had a great deal to do with his death, but I believe that if a proper place could be provided, this one of America's animal oddities could be studied and better understood and fewer people would wish to destroy it.

After all, the preservation of our wild life and the balance of nature is our chief object in studying these things by means of zoos and personal pets. And let us hope for the day when the superstitions, fears and dread of these beautiful and interesting little animals shall vanish forever.

A Song

PAUL TEWKSBURY

Life's not the same since she left me—
  The skies are not bright as they were;
The flowers all are faded and sickly—
  They seem to have bloomed but for her.

The birds sing no more in the garden
  In vain did I ask them to stay;
And even our little canary
  Has been silent since she went away.

Humane Education Made Compulsory in New York State

The following very stringent law has passed the New York State Legislature making it obligatory to teach the children in the Public Schools the humane treatment of animals. The Editor of the NATURE-STUDY REVIEW realizing fully that most teachers have given little attention to this subject as a part of the school curriculum will try to do her share by writing and publishing in the REVIEW each month for the coming year, a carefully planned lesson for each week which will cover the points demanded by the law.

LAWS OF NEW YORK.—BY AUTHORITY

CHAP. 210

AN ACT to amend the education law, in relation to instruction in the elementary schools in the humane treatment of animals and birds.

Became a law April 19, 1917, with the approval of the Governor. Passed, three-fifths being present

The People of the State of New York, represented in Senate and Assembly, do enact as follows

Section 3. Such chapter is hereby amended by inserting therein a new article, to be article twenty-six-b, to read as follows:

ARTICLE 26-B

SECTION 700. INSTRUCTION IN THE HUMANE TREATMENT OF ANIMALS AND BIRDS

Section 700. *Instruction in the humane treatment of animals and birds.* The officer, board or commission authorized or required to prescribe courses of instruction shall cause instruction to be given in every elementary school under state control or supported wholly or partly by public money of the state, in the humane treatment and protection of animals and birds and the importance of the part they play in the economy of nature. Such instruction shall be for such period of time during each school year as the board of regents may prescribe and may be joined with work in literature, reading, language, nature-study or ethnology. Such weekly instruction

may be divided into two or more periods. A school district shall not be entitled to participate in the public school money on account of any school or the attendance at any school subject to the provisions of this section, if the instruction required hereby is not given therein. The commissioner of education shall, pursuant to this act, cause the consideration of the humane treatment of animals and birds to be included in the program of teachers' institutes.

Sec. 4. This act shall take effect immediately.

STATE OF NEW YORK
OFFICE OF THE SECRETARY OF STATE, } ss:

I have compared the preceding with the original law on file in this office, and do hereby certify that the same is a correct transcript therefrom and of the whole of said original law.

FRANCIS M. HUGO,
Secretary of State.

The Duty of the Humane Society Toward Compulsory Humane Education

BY STELLA J. PRESTON
Chairman New York State Humane Education Committee

It is with the deepest sense of gratification that The New York State Humane Education Committee announces that compulsory humane education is now a regular feature of the curriculum of the elementary schools in this State; it being known as Chapter 210 of the Laws of 1917.

The old adage, "You can lead a horse to water, but you can't make him drink," is particularly applicable to this case. The mere passing of a law does not make sure its enforcement. This is where the duty of every humane society begins. The writer wishes heartily that the word "compulsory" could be entirely eliminated, because an enforced task is never a pleasant one. Yet, this seems to be a stern necessity. To make the law effective it must have that force behind it. It has been so since the beginning of time. The law commands a respect which no moral suasion will inspire. Many instances may be cited where humane education has been enforced for such length of time as some

organization or interested person was behind it; but as soon as that impetus was withdrawn, the subject was gradually crowded out or forgotten altogether. After a painstaking survey extending over many years, it was this fact that convinced the author of the bill of its necessity. Active live interest, on the part of humanitarians combined with the effective arm of the law, should make New York State the leader in humane educational matters.

Let us consider some of the means by which humane societies may make this law a pleasant feature of the school work—ways by which the teacher often burdened with duties far beyond her strength, may see in this a possible help—an inspiration—a broader vision. It is a recognized fact that in many of our schools some form of ethical instruction is a daily part of the school life; either by the methods adopted by those who believe that children should be taught kindness and justice, through the medium of kindness to animals, or in some other manner, but it was to make a common practice of teaching humanity that this law was passed.

As a well known educator expresses it: "It is making common justice a common practice. Humaneness is nothing more or less than justice, and as justice is an invisible quality, there can be but one kind for all creatures. It aims to encourage good thoughts and feelings and the actual performance of kind acts, and offers many golden opportunities for such expression. When the pupil grasps all that this means, then he himself becomes a humane instructor." It is by this method also that the teacher is reached. Find in her that invisible something which spells humaneness and all who come under her influence are unconsciously bettered.

What inspires workers who are striving to prevent cruelty to little children and helpless animals? Humaneness. What is the spirit which builds hospitals and charitable institutions? Humaneness. What is behind all the great effort that is being expended on our Red Cross? Humaneness. And greatest of all, what is the motive with which our country is entering upon this greatest of all conflicts the world has ever known? The supreme act of humaneness.

Why then is it not the duty of every teacher in every school, in every state, in every country, to make this invisible quality so much a part of the life of every child, that the generations to come shall be a greater, and a stronger, and a more humane people, and world kindness as well as world peace shall be a reality and not a

dream. But, you must bring the realization of this to the teacher, who possibly in her busy life, may not have glimpsed it. Visit your superintendent of schools, calling his attention to the statute, and seek his co-operation. Through him reach the school principals and the teachers, and call to their attention the great possibilities of this subject. Co-operation should be the keynote of your efforts. No teacher will fail to appreciate a sincere desire to help, and an intelligent co-operation with her to secure the greatest benefit to the child.

The law reads: "Such instruction shall be for such period of time during each school year as the Board of Regents may prescribe and may be joined with work in literature, reading, language, nature-study or ethnology. Such weekly instruction may be divided into two or more periods."

What a broad scope this gives the teacher—First consider literature—how many stories and poems there are, that by their character develop the sense of sympathy and justice. The same may be said of reading and language—what a choice there is in reading to select from, stories which teach breadth of interest and sympathy toward all creation, both human and dumb, and in language—what a variety of subjects for story-telling, composition or essay writing, subjects that will bring out all the broader vision of a child's mind, and a breadth of sympathy ranging from the lowest to the highest form of life. Then comes the correlation with nature-study and ethnology—studies of animal life and human life. Many educators feel that humane education is applied nature-study, and it is true, that in nature-study there are many oppor tunities for its application. It is because animals make up a large part of the child's every day environment, that teaching kindness to animals seems the most natural and simple method of developing the character of the child. It fosters the spirit of protection toward something helpless and weak. While studying the nature and habits of the animal creation, the teacher may specialize upon the uses, the sufferings, and the rights of those same animals; not simply confine herself to the antennae or vertebrae of the subject. "This may require a change of heart greater than a change of program." Ethnology—a subject for advanced pupils—the science of the races and families of man—here may come a practical application of the Golden Rule; one's duty toward one's neighbor, and the large economic problems which are engrossing the world.

But you will hear from the teacher: "Am I expected to fulfill all of this huge contract? Am I to be parent, spiritual adviser, as well as teacher of the three R's?"

There is no question regarding the fact that the proper place for the moral development of the child is first in the home, then the church, but unfortunately parents are often wholly or partially neglectful of the principles of right conduct. Then the responsibility falls upon the State. It has been aptly said that it is as impossible to teach a pupil to play a piano by ear, as to teach humane education by any set of rules. The nature of the subject makes it impracticable to limit it to any formal scheme. The teacher must be imbued with the spirit of the task—that invisible something which we call humaneness, and be sufficiently interested and intuitive to devise ways of expressing that humaneness to her pupils. Then, and then only, will the spirit of the lesson emanate from her to them, and as a superintendent of a school where this has been successfully demonstrated says: "It becomes the strongest and most vital of all the forces in the school." Again, we come to the duty of humane societies—to so present this matter to the schools that it shall not be a subject new and strange, but that it may slip into the school life without friction or controversy.

It is an encouraging fact that in no school where this subject has been intelligently treated, has it proved a failure. Lack of interest and co-operation on the part of those who should be responsible for its success, is the usual cause for its failure. Such expressions of approval as: "I wish you to know how successful the humane training has been in our school,"—"I feel that this training will in time decrease very materially the sum total of suffering in the world."—"The work of our school is easily adjusted to meet the demands of humane instruction."—"Of all the topics in our curriculum, I consider this the most important."—are conclusive evidence that when the methods employed are practical and attractive, the results are all that we would desire.

New York State has upon the statutes as good and effective a law as any in the country. The fact that the length of time required for the teaching of the subject shall be prescribed by the Board of Regents is a measure of strength rather than weakness. Again, it is the spirit not the letter of the law we wish to impress upon the school people; not the number of minutes per week. When this spirit of humaneness once permeates the school, the benefit will

not be figured by time, but by results. The clause stating that: "A school district shall not be entitled to participate in the public school money, if the instruction hereby is not given therein," gives the necessary force to the law. Let us hope the penalty may never be applied.

And so it is your duty now; to acquaint the schools in your respective locality with the nature of the law; to aid in every possible way by your interest, your means, your example, your character in the enforcement of the law. Visit the schools, offer prizes, distribute literature, give talks, and above all, let that invisible quality, humaneness, so illuminate your lives and character, that it will envelop the teacher, who in turn will so grasp the great opportunities and the ethical value of the subject, that she will in turn impart its principles to her pupils. "Rome was not built in a day." We cannot hope that everything will be accomplished the first year, but never were humane societies confronted with a graver responsibility than this their duty toward the compulsory humane education law.

Pets in the Trenches

A war correspondent tells us: "Of the pets the dog is by far the more numerous and popular. There are goats and cats and canaries and various species of mascot, but the dog becomes more a part of the life than any of the others. Many a subaltern or company commander has gone "over the top" into battle with his dog leaping and barking happily beside him. Scores of dogs have been killed beside their masters, and hundreds wounded. In the fighting about Mametz during the great push on the Somme a Red Cross searching party came upon a pathetic little group composed of a subaltern, his dog, four private soldiers, just as they had sprawled to their death in a burst of machine gun fire."

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

THE NEW YEAR

Who among us shall dare to give to our friends this year, the gay and joyous greetings that have fallen so readially from our lips in times past in wishing "A Happy New Year!" And yet there has never been a season in the lifetime of this generation when the heart so deeply and sincerely wished for every one a happy new year. But now, however fervently the heart may wish it, the head crushes back the expression by the thought, "How can the new year be happy with the whole world at grips in the deadliest and cruelest war known to the history of our planet?"

No, the wishing "A Happy New Year" can be but a hollow expression weighed down as we are by anxiety and the conviction that happiness is not likely to be a general possession anywhere during 1918.

Therefore, let us change the form of our greeting this year and say, "May the New Year afford you new opportunity to serve humanity; and may it bring you the desire to serve, the faith that right will triumph and the strength to endure to the end."

THE NATURALIST IN TRAINING CAMP

We have always maintained that an intimacy with Nature and an interest in her ways will ever prove a resource for entertainment and give a sense of companionship under whatever circumstances that life may impose. The following extract from a letter from Mr. Chester H. Menke is given as evidence of this. Mr. Menke is known to many readers of THE REVIEW as Instructor in Nature-Study at Cornell; he is now at Camp Sherman at Chillicothe, Ohio.

"And as I go marching along on these wonderful autumn days I think I get more from them than a great many of the men whose only pleasure in life is of a physical nature. I love to watch the spider go by with his silken sails unfurled to the clear and steady breeze of Indian summer. And if perchance one loses hold and alights upon the hat of the individual in front of me, I love to watch him try all sides of the hat, to fix the direction of the breeze and when at last he has succeeded, after many seemingly unnecessary movements, he raises himself on his front legs as high as possible, tries his muscles and with one last effort jumps into the breeze and goes floating away with only a few silken threads, as stately and with the ease of Aphrodite herself. In the meantime, the command, "squads right!" has been given and I find myself eyed doubtfully by officer or squad leader, and again I come back to earth to do that which is most primitive."

Teachers' Corner

If we only could now and then pry open the heads of our pupils and find all that is stored there as the direct results of our teaching we would undoubtedly put on sack-cloth and take to some other profession with mortification and celerity. Occasionally we gain a glimpse of what we have really taught and find it so far afield from what we thought we had taught that we can only gasp and wonder. Fortunate is the teacher who can retain a sense of humor under this ordeal. The Editor remembers well once upon a time she lectured to a very respectful and attentive class at Chautauqua, N. Y. One item in her theme was the clever device for escape used by the caterpillar that forms the spindle-shaped gall in the stem of the golden-rod. She warmed up to her subject and felt truly eloquent and the class responded with enthusiasm. Later in the day, during a field trip, this gall was found and its wise occupant and his skill in making beveled edges to his exit door were shown to the pupils at which one exclaimed incredulously, "Isn't that wonderful! What Mrs. Comstock told us is really so, isn't it!"

A nature-study and biology teacher somewhere in America has sent in the following casket of jewels culled from the free expressions of her pupils regarding their observations and conclusions in the wide domain of nature. It is needless to add that this teacher has a keen sense of humor:—

"Organic matter is when you have something the matter with your organs."

"Five devices by which seeds are scattered are wind, water, explosion, torn up, taken out, and thrown away."

"The peculiars of an insect are some of them bring diseases, others destroy food, suck the blood, spoil the flowers, lay eggs and kill babies."

"The grasshopper, when he walks, he either jumps or hops."

"The jaws of a grasshopper move east and west."

"A larva is an unfinished animal."

"The flower is to show what a plant can do."

News Notes

CALIFORNIA

The California Blue Bulletin begins with the slogan, "The World must be made safe for Democracy" and follows with some excellent advice to school boys from the Secretaries, War and Navy, General Wood and the Postmaster General.

Secretary Baker says: "The most useful thing a high school boy can do is to finish his course, because the nation in the next years will need all the trained men it can find."

Secretary Daniels says: "Boys too young for military service now should be studying and training when practicable so that when they become of age they will be better trained if called upon to serve than their elder brothers were."

General Wood says: "Every boy should finish his school course. We shall secure more men under the draft than we can arm at the present time."

Postmaster General Burleson says: "It is of vital importance that there be no 'slackers' in education. The completion of the high school and college courses is well-nigh imperative at this juncture of our entry into world affairs. Nothing except the country's call in the defense of liberty should prevent it."

CONNECTICUT

The Hartford Bird Club is one of the most active in the United States. The following items as to the work accomplished by it are extracts from a letter from Arthur G. Powers, Secretary of the club:

Our club is confined almost entirely to bird study, although, as a matter of fact, we usually have talks from persons interested in other lines of nature-study at infrequent periods. As a matter of fact, the whole study of nature in itself is so closely interwoven it is rather hard to select any one element for the sake of study without in some measure overlapping into some other element.

It might be interesting to you to know that we have had Mr. Louis Agassiz Fuertes, lecture to our club, and that we are to have Mr. Dallas Lore Sharpe lecture to us in connection with which Mr. W. B. Gillette, the artist, is to exhibit some of his water colors of birds, fishes, etc. We have from twenty five to one hundred on each of our outing trips, or field trips, no matter what the weather, and I should say we have an average attendance at our evening meetings of one hundred, which would seem to indicate that bird study in this locality was a popular and lasting pursuit, for we have been organized now since 1909 and at no time during that period have we had any more members than at the present time.

We have a bird sanctuary of 2500 acres in the suburbs of Hartford, which is posted by the State Fish and Game Commission, and on which the club has erected 140 or more bird houses of their own styles and makes. We have also erected feeding trays, planted wild shrubs and seed which might induce birds to remain within its borders, and have not only catered to the birds themselves

but also to the inmates of two tuberculosis sanitoriums located within its borders, as well as the inmates of the Connecticut Home for Crippled Children also located there.

Our club was prime mover in the formation of a federation of bird and nature clubs in Connecticut, on which we have been working for four years and which was organized at Fairfield, Conn., in May of this year, at which were represented some twenty odd societies in the state interested in similar studies, and by 350 people. This organization is known as the Connecticut Federation of Bird and Nature Clubs.

TO OUR SUBSCRIBERS

Please note your expiration date and send in your renewals promptly.

Owing to the increased cost of paper and printing, also to the fact that The Nature-Study Review has not raised its subscription price, we will print only enough magazines each month to cover the subscription list and its normal increase.

A blue check on the wrapper indicates that your subscription expires with this number.

The "Bluebird" by W. P. Alexander that appeared in the Bird Number of THE NATURE-STUDY REVIEW has been reprinted in the "Poets of the Future," A College Anthology for 1916–17 published by the Stratford Co., Boston.

The beautiful picture of the California Quail used to illustrate Mrs. Siniman's story in the December NATURE-STUDY REVIEW was made from a photograph, taken from the living bird by Dr. R. W. Shufeldt. Through a mistake no credit was given with the picture.

Field Book of American Trees and Shrubs, F. Schuyler Mathews. G. P. Putnam's Sons. 465 pages. $2.00, bound in cloth; $2.50, bound in full flexible leather.

Field Book of American Wild Flowers, revised and enlarged, twenty-second printing. *Field Book of American Wild Birds and their Music*, fifteenth printing, by the same author and publisher and sold for the same price

Mr. Mathews has long been known to the lover of out-door life; in fact he was the first writer in Nature-Study in America to give us popular information in regard to the familiar trees, plants and animals. He is always reliable, and writes most interestingly and with his skilled and artistic hand, pictures for us what he describes. His drawings are accurate and truly illustrative.

In 1902 appeared his Field-book of American Wild Flowers and the Editor has already worn out two copies of this admirable little book. It is just the size to slip into the pocket, it is very fully illustrated and it gives what so few of the identification books give,—interesting and important facts about the habits of plants. And while there are in this volume 24 attractive, colored illustrations, yet these are no more useful than the pen and ink illustrations which are as near perfection in the matter of specific characteristics as is possible for an artist to make.

In 1904 followed a volume of similar size,—The Fieldbook of Wild Birds and their Music. This is a serious attempt to transcribe the songs of birds. Unfortunately the writer is not a musician, and also has never yet found an instrument with sufficient bird-like tone to play the notes in any adequate manner. But the book has been of great use for there are 38 colored plates and half as may illustrations in black and white, and the accounts of bird habits are excellent. Moreover, there is one lesson that the book teaches to even the most unmusical and this is the great variety of songs the individual of a species develops, a fact often ignored.

The Fieldbook of American Trees and Shrubs, which has recently appeared, is in many ways the most ambitious volume of the series, since it covers the more common trees of the Pacific Coast. However, it is essentially a book adapted to the United States east of the Rockies. The strong point in Mr. Mathews descriptions is that he tells us tersely those things which we most desire to know about a species. This is especially true, in this volume, of those trees with which he is personally familiar. Mr. Mathews shows his courage by describing 69 species of *Crataegus* and his most valuable contribution to the separation of the species of Hawthorns are his very graphic pen pictures of the leaves and fruits. (The writer always secretly believed that the Creator

int ended theHawthorns to show that He could create a species in which no two individuals need be alike.) Mr. Mathews has dealt in a like masterly manner with the many puzzling species of Willows.

The volume is superbly illustrated; it contains 16 full-page illustrations in water color and 50 in green crayon, all showing the characteristic forms of trees. However, of far more importance in identifying species, are the pen drawings of leaves and fruits of which there are a very large number and which will demonstrate again to an admiring public Mr. Mathews' accuracy and skill as a natural history artist. At the end of the volume are 36 pages of maps showing in a graphic manner the distribution of tree species. Following these are maps showing the lands of the U. S. almost exlucively in private hands, one showing the altitudes in the U. S.; one showing the geological structure as a foundation for a character of different soils; one showing the soil characters and others showing the mean temperatures of the U. S. in January and July. The book begins with a key for the identifications of species by the leaves and ends with a key for the identification of the trees by the character of the bark, the latter being helped by 18 photographic illustrations. The size of the book which is 4 by 7 by 1 inches is most convenient for carrying on field excursions and there is a vast amount of information packed into its small compass, and fits it in every respect to be what it is "Special Edition for Members of the American Forestry Association."

Message No. 3—Courage. Message No. 4—Little Lights, published The Trotty Veck Messengers. Saranac Lake, New York. Single copies not for sale Two copies, 25c. Ten copies, $1.00.

Again there comes to us messages from these brave young men who are in temporary exile while gaining health from tuberculosis. These two booklets are overflowing in the courage and cheer. Nothing could be more helpful, sent as a New Year's Greeting to friends, than one of these books, especially this year when we all need fresh courage: "Remember the steam kettle—tho' up to its neck in hot water it continues to sing." "The world moves from West to East. Trotty says if you do not like it get on the moon: it goes the other way." "Evil thoughts like green apples upset the whole system."

By all means send for some of these booklets and pass them around—They will help!

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THE
NATURE-STUDY REVIEW

VOL. 14 FEBRUARY, 1918 NO. 2

The Humanistic Element in Education

L. H. BAILEY

President's Address at Annual Meeting

[The speaker explained that he had discussed "The Science Element in Education" before the Central Association of Science and Mathematics Teachers at Columbus, Ohio, November 30. He stated his point of view in that address: We are born to Things and to Phenomena. The regulated knowledge of Things and Phenomena is Science. As we depend on Things and Phenomena, so is the science of them essential; and what is essential is necessarily educational, if we are to live rationally. We are in error in supposing that there is a necessary educational line between "humanities" and "science," and we perpetuate error and hinder progress by the liberal use of these and other catch-words. We are misled by our phrases. In the present address the speaker sought still further to break down the prejudices between what may be called the old-line and the new-line subjects. A full abstract will be found in *School Science and Mathematics*, and an extract in *School and Society*, for December 29.]

We are born to People. Probably our first acquired knowledge is of father and mother. Human forms impress us so early that we never know that we never knew them. Brother, sister, family, the gradually enlarging circle of those of whom the child is "not afraid," make up the early experience. Soon the child begins to have consciousness of the many people, the strange people, those who quickly come and go, those on the street, in wagons, standing on the corners, waiting at the big places. The world is full of folks.

Soon the individuals begin to separate from the crowd. Faces become so familiar that the child names them and identifies them. Each one is unlike every other one. The child says that some persons are "funny."

Yet the moving crowd of human beings is the great fact of life. It is the great fact of the earth. These beings are gregarious. They move in long lines. They swarm in great masses. They colonize themselves in tense confusions that we call cities. Now and then one being separates itself and lives apart. That one is queer, clearly an aberrance. Most of us come back to the crowd

as the meteor seeks the earth. Even when we are separate we talk in terms of the crowd. To go alone is unusual. When we go by ourselves we write a book about it.

What I mean to say is that human beings express habit and habitat, as do other animals. We are so accustomed to the habits that we think of them only to approve or to criticize. Yet essentially the habits of John Smith the Man are as interesting in themselves as are those of Lobo the Wolf, Black Beauty the Horse, or the Cat that Walked by its Wild Lone. But we fail to observe John Smith objectively.

As there are laws of the Pack and laws of the Jungle, so are there laws of the Camp of Homo. At first the laws of the Pack and the Jungle and the Camp were probably much the same; but the Camp became crafty, self-willed, and it made weapons against the others. These weapons it turned also against the Other Camp. The Camp has come a long journey since then, but it has carried its weapons all the way.

The Camp found Speech and Handicraft. It found Importance, and set down its thoughts on stone and ivory and bones. It found Paper. Then it kept Records. Then did Literature begin. And in due time Men knew that they were Men, and wrote down the joy they had in thinking.

They thought about themselves and about Beings of another world; and so great and important were these Beings that Man fashioned them in his own image and endowed them with his own qualities. So Man began to speculate, and to weave a vast web of fancy about himself and the Stars and the Things He Does Not Know. This web we call Literature, Philosophy, Art, Religion,—what you will.

And in due time Man came to be curious about the Things-Around-Him. He pried into them. He looked into crevices in rocks, ran his fingers along the seams of wood, found new metals, counted the eggs in a thousand nests, unravelled the flowers, searched for the alchemy, explored every wonder, enciphered the universe in formula and symbol. At some point in this long process he wrote down what he saw on papyrus or pieces of paper; then was Science born.

Very exact is Observation and very direct and true are Results. But these are first observations and first results. When we look again we begin to doubt. When we make a Conclusion we

immediately set about to show that it is not true. They still say that there are "exact sciences;" if there are such, they must be those not founded on observation and experiment. I heard a man expound for an hour, with floods of numerals. He said that he had "proved" something. I do not know what it was.

So the deeper we settle into Science the more do we discuss and explain, which means only that we are trying dimly to understand. And the scientist becomes an hypothecist. To-day the plant-breeder is a mathematician, the zoologist is a speculator, and the geologist is a seer. And it endeth in Literature, Philosophy, Art, Religion,—what you will.

And it came to pass that men said one way was the best way and other men said their way was the best. And one man called his way Humanistic and the other called his way Scientific; and straightway they made much trouble for themselves.

One day we may forget distinctions that do not distinguish, and we may devote most of our energy to doing our piece of work well and to making ourselves to be as little children that we may teach simply and easily and directly.

Perhaps it would be impertinent, but I do not see how we can ever understand human beings or know what their habits mean or judge them fairly unless we observe them impartially and objectively. Now we judge them by ourselves. We think of them mostly as bearing "conduct" rather than as exhibiting characteristics. Never can we realize the brotherhood of man till we divest ourselves of prejudgment (which is prejudice), of assumed standards of ethics, and study human beings impersonally. Medicine could make no progress till it passed the idea of demons, of control by extra-terrestrial agencies, special providencies, and judgments for sin. Our actions and habits issue from causes and they follow courses which may be understood. We do not understand them by sitting in judgment, although by that means we may protect society. The new penology has its root here. We begin to see that conduct has a rational basis.

All the "humanities" in education are worth as much as the "sciences" in the training of the young, if there are as good teachers, with as good facilities, to teach the one as the other. All these subjects are organized out of the human mind; the same quest of truth is in them all; the same integrity of thought may characterize

them all. It is not true that a subject is useful in education in proportion as it can be applied in the affairs of life. It is not true that any subject is even relatively useless because it cannot be "applied."

Man is as much a part of nature as is a pigeon or a trillium. Did not Huxley write on man's place in nature? It is an incomplete nature-study that eliminates man from its range. What we now need above all else in nature-study is a good procedure on the observation of human beings.

If man is part in nature, if he has had a progressive evolution, then his habits and also his institutions are but parts of his natural history. Tradition itself is a phase of the natural history of the race, and becomes an essential part in any worth-while study of the race. These traditions express themselves as well in what we call science as in what we call classics. They are expressions of our development within our environment and in contact with our fellows. Against all this background, the discussion of the relative importance of the humanities and the sciences seems trivial and empty. These historic separations should now be forgotten, as against the common interests of mankind.

Always have I tried to present to you the wholeness of nature-study. From the first I have stood against the exclusive observation and study of the objects counted as "practical." This is not because I am opposed to the practical and the applied in education, but because such narrowing of the subject presents a wrong and restricted view of nature. In whatever the child takes up, I have wanted it to see the animal or the plant or the situation as a whole, and as part of its environment, and not merely as yielding certain products or benefits.

The interest in itself and its right to live,—this is the reason for the study of any living object, whether a frog, a cabbage, a horse, or a human being.

So should I be careful that nature-study does not degenerate into a study of attributes. In at least one State a law compels instruction in the elementary grades "in the humane treatment of animals and birds." The humane interest in "animals and birds" results naturally from a knowledge of them. The teaching of humane natural-history subjects as a detached and literary exercise is both weak education and insufficient morals. It is like teaching the odor of the rose.

It is the unfortunate impediment against nature-study, in the estimation of many persons, that it fits only partially into the regulated schemes of education so much prized at the present. Pressed into these patterns it loses much of its freedom. Situations in nature are unfortunately disregardful of a syllabus and unconcerned of "credits." Even our nature-study writers are likely to take the attitude that nature-study must be so regularized as to allow it to be handled uniformly in all schools by all teachers. We are verily obsessed of uniformity, as if it had merit in itself. By this dominated uniformity we withhold the best teachers, discourage the mutations that make for progress, and stand in the way of leadership. I think we should encourage departures.

It is possible, I am convinced, to apply enacted law to education for the purpose of safeguarding public funds and establishing an institution for the advancement of all the people at the same time that we allow the development of the full personality and initiative of strong teachers. Good system and method are much to be encouraged if they are in the nature of tested educational programs, founded on what we hope will some day be the science of education. This is very different from implanted governmental orders and insistence on the mere machinery of operation. Our law-made education, paper projects, and office regulation force our work into the plane of uniform mediocrity. All uniformity is mediocre.

I do not care to have nature-study similarly or equally taught in all schools. I hope something better for it than this. We are now in the grip of an artificial standardized system, matching well with the present theory of civilization. In due time, however, we shall return to the old conception of teaching, which is the principle of discipleship.

What, then, is my plea this morning? This only: that human beings are prime subjects for nature-study; that the old distinctions between the humanities and the sciences, represented in many catch-words, are essentially false; that nature-study stands for the spirit rather than for the form, and is to that extent a saving grace in the dominated systems of the day. I would make nature-study contribute to brotherhood. Nature is not an organized and classified procedure, as are the institutions of human affairs: the ultimate truth in nature is not yet discovered in statutory educational systems.

Science and Nature-Study

S. C. Schmucker

Department of Biological Sciences, State Normal School, West Chester, Pa.

There seems to be room for almost perennial misunderstanding between the teacher of nature-study and the scientist. But there has come an interesting alteration in recent years in the attitude of the scientist to the teacher of nature-study. At first the scientist looked upon the nature teacher, when he thought of him at all, as just within the range of his contempt, and when a certain noted public man of very versatile mind and considerable experience coined the term "nature fakir" to apply to the author of a series of stories, the purport of which he had not really caught, the scientific world backed up the cry and anyone who studied animals without using the microscope and without chasing them through analytical keys, and tacking the Latin names to them, became from that time on a nature fakir. Even so good a student of nature as John Burroughs fell into the same error, and did not realize that anyone whose aims and methods were not his own could have honest or honorable purpose in the work he did.

Of recent years the attitude of the scientist has had a distinct change. If he pays any attention to the nature teacher it is a very patronizing attention, and he shows his entire willingness to rob himself of a portion of his leisure in order that he may uplift this poor nature teacher, and bring him into proper connection with the scientific world. It is this latter attitude which is the one fraught with danger for nature-study. Until the scientist is broad enough to realize the aims and purposes of nature-study and ceases to look upon it as the first step towards university training, he never will be a good guide to the teacher of nature. He may be an entirely good source of scientific information, and on this account be valuable, but the mind of the teacher must transmute the material gained from the scientist, and often eliminate the major portion of it completely, transforming the rest before it will at all serve as material for nature teaching, though it may form a splendid background in the mind of the teacher who knows how to transmute it. Dean Bailey got the distinction marvelously many years ago when he said in substance that when we are thinking particularly of the subject we are studying, and are organizing

our teaching with reference to that subject, we are teaching science. But when we teach about these things with our thought chiefly upon the child, his capacities, the nature of his mind, the nature of his interests, then we are teaching nature-study.

When the great wave of modern biology swept over England, stimulated by Darwin's "Origin of Species," Professor Huxley determined that the elementary schools must gain the advantage of this new teaching, and therefore he made or caused to be made a series of science primers. The completeness with which they have dropped out of the field, their constant presence in second hand book stores, and entire absence from the stores that sell new books, tells the tale of a scientist of earnestness and power who mistook his field when he tried to do this. He had the idea that elementary science meant the general principles of a science in simple words. He forgot that after all, it is not the words that are hard to understand in a science, it is the ideas. Mastery of terms is comparatively a simple matter, and requires no great brains, but the mastery of fundamental principles is a vastly different thing. Any immature mind studying and handling fundamental principles may say them quite as roundly as the scientist, but it is a quality he shares with the victrola record. He can say back things that have been said to him.

Agassiz on this side of the ocean, was filled with the same noble design, and started a series of little guides to science teaching. These were better than Huxley's primers. A few of the numbers were rather good for their purpose. But when Alpheus Hyatt wrote his little book in this series, which he characteristically called "Insecta," he put together the most complete cemetery of dry bones of knowledge it has ever been my misfortune to look into.

The truth of the matter is that if we are to teach nature-study where it is commonly taught, that is, in the first four grades of the school life, where we are compelled to choose between a good teacher of children, and a good scientist, we can trust more securely the teacher than the scientist. Her good sense will guide her into the selection of the facts in nature around about her, better than his good sense will guide him in an understanding of the mind which is to take his work. Of course, the ideal condition is gained when we can have a teacher who is both the skilled handler of young children, and the trained scientist, but such a combination is exceedingly rare. I think I only know of two people who really

approach it, and I know of no one who ideally attains it. The most common approach to the ideal is secured when in a school where there is good pedagogical training, the students also are trained in nature-study under someone who has had distinct scientific training. Accordingly, the people who are directing the teaching of nature-study in the public schools, and the people who are teaching, in our normal schools and universities, the students who are later to teach nature-study, should have good scientific training.

Even in cases like this, the scientist who has constantly in mind the upper portals of scientific knowledge, and is constantly thinking of a student as facing towards these portals and hoping fondly to reach them, will hit wide of the mark when it comes to nature-study. Nature-study is not a first step to cytology and morphology, or to the systematic study of any group of animals or plants. Nature-study is, on the other hand, a step towards a full and appreciative sense of the meaning of ones environment in every-day life. Of the students who begin nature-study, not one in five hundred will ever study zoology even beyond the most elementary text book, but all of them are going to live in contact at least with a few animals and plants, even though they live in cities and their contact is confined chiefly to such things as they find in parks or while on the infrequent summer vacation. But the majority of them will live in daily contact with trees and grass, with birds and flowers, and with the domestic animals at least. A familiar knowledge of the most obvious and most immediately interesting things concerning these creatures will give to the life of the man who lives amongst them an added richness which is the finest fruit of contact with nature.

On the other hand, the ease with which even good college students forget within a few years most of what they gain from any one of the higher branches, unless they continue the cultivation of that branch either as a necessity of their business or as a relaxation, is evidence enough not of the worthlessness of these things, for all earnest, faithful study is good, but it should show us how useless it is to make the ideas which are brought out only by the most elaborate study the conscious goal of the beginnings of contact and appreciation of nature.

Another of the thorough and kindly aims of the scientist is to do with reasonable thoroughness and completeness whatever he

does. Hence the almost certain criticism which he will make against nature-study, that it is too scrappy, too unsystematized, that it gets nowhere. As a matter of fact the mind of the child is scrappy, unsystematized, and gets not very far in its earlier years. And while the child is in these years, and this means until he has reached the stage of his grammar school life, thoroughness is foreign to him, and when attempted simply makes of school life drudgery. Thoroughness comes with the years of reason and training, and conscious attention. And these are not yet, with the child.

I trust I am not misunderstood in this matter. I have not the faintest trace of the scorn for the scientist which the scientist commonly visits on the nature teacher. I marvel and admire the thoroughness of many of my scientific friends, and I wish everyone, if it were possible, could have in his training a part of this thoroughness. The mass of detailed information which some men carry concerning obscure matters, unknown almost to the entire world outside of themselves is to me marvelous, and I often long to know some field of knowledge as some of my friends know theirs. But my lot has been cast in other lines, and those lines have so fully occupied my time, that there is for me no possibility of the intensive study of any one line.

No teacher can have too much knowledge, providing he does not lose his perspective and knows which of his knowledge to use which is appropriate to the event which has called it out. Certain it is that the student of zoology who comes to teach nature to children may himself have what knowledge he can gain of the internal structure of an animal, but he must practically leave all of it out of his nature-study teaching. I have even come to doubt whether it is good nature work to kill, dry and mount insects, and am quite sure that the shooting and stuffing of birds is not nature-study. The more children can see all of these creatures alive and active in their own environment, the more nearly they will approach true nature-study.

The aspect of things which is best worth while is that of life relations, the study of birds in the field and the wood as they gather their food, as they woo their mates, as they build their nests and rear their young, these and other studies like them make the best nature work for children. To watch the insects on the flowers, to find the seeds carried by wind or animal, to see the tall-

ness of the grass with its straight leaves and the flatness of the plantain with its round leaves, to find the big leaves of trees on the ends only of the branches, and the whole of the tree to be full of leaves when the foliage is finely divided, to see the trees growing heavy on the lighted side and lighter on the dark side, to see forest trees growing without limbs, and trees growing long limbs, close to the ground in the open field—these are the things which for the ordinary student are distinctly worth while.

There is one other matter which I feel the scientist has never properly understood. There is no reason whatever, in teaching children, why we should not personify annuals and flowers and represent them as talking. The only necessity is that they should say the right things.

Children will not grow into misconceptions from this teaching. They will not grow up with the idea that the animals have all our powers of language only we do not understand them. The growth of the child's mind into that of the adult will give them the power of correction. What was perfectly legitimate teaching for the child would later be foolishness. But we must be very careful not to teach the uncolored truth to little children, or it will fail of their comprehension and the whole impression will completely fade away.

I was standing one day years ago in the hall of the Library of Congress in Washington and talking with an artist about the decorations of that remarkable building. I said to him, "The whole thing looks to me altogether too gaudy. There is too much red and too much gold about it all for me." His reply astonished me. "You think these paintings are made for to-day. These paintings are made to last for centuries, and if they were toned into softness of harmony to-day, they would fade into utter flatness after a while. Now they seem to you crude, but in a few years they will sink into a rich fullness of color which they will then maintain as long almost as this building can stand." Time has already justified this artist. Already these colors are blending. The garishness of their first effect has past away and an even richness is rapidly taking its place.

Just such must be our teaching of children. There must be over emphasis, there must be heightened coloring, but these will fade and will sink to their proper places, leaving for the future possession of the grown mind the full and rich effect.

The Spirit of Nature-Study

Cora A. Smith
Erie, Pa.

These are days when every teacher is thinking: "What is the relation of my work to this great onward leap of the nations? Is my work vital in the lives of the men and women of to-morrow?" And the nature-study teacher, most of all, perhaps, is compelled to think of the eternal verities, with the part they play in human affairs, in order to satisfy herself that she is essential to the welfare of the community.

Teachers have been recently called by Dr. Finley the "Army of Future Defense," and we are assured that education is the greatest work of the nation even now, paradox as it may seem. If this be true, what is the part of nature-study in the greatest work of the nation?

By "The Spirit of Nature-Study" we mean the deep, underlying motive in the soul of one who loves to direct children to first-hand acquaintance with the common things of nature. This motive finds a counterpart in the mind of the child, who longs to know all things. And the child goes on its way rejoicing in knowledge of the hows and whys. The spirit is the same in teacher and pupil. In fact, it is the spirit of nature herself. "The wind bloweth where it listeth, and thou hearest the sound thereof, but canst not tell whence it cometh, and whither it goeth: So is every one that is born of the spirit." We like to think that the spirit of a child naturalist is one and the same with that of the world-famous scientist who gathers facts and draws conclusions. The child follows the clues of the birds and wild-flowers and draws his own conclusions.

But is it true that to be able to bring children into contact with the truths of nature, is to help mould this great Army of Future Defense? Will contact with nature's truths fit future citizens for the new and glorious epoch, so valiantly won by American manhood, at so great a sacrifice? The Army of Future Defense is going to continue fighting for the brotherhood of man. Its soldiers are going to be filled more and more with the spirit of Him who said "Consider the lilies of the field, how they grow." And just as in the present crisis, among the first to respond to the call

of their country have been the youths of our colleges and schools, trained in the history of human events and willing to fight for an ideal, so in this future army, the soldiers will be equipped with knowledge of the wonderful ways and means of nature, and of man's place in nature. But they will also know that the struggle for existence has already been won by Love over Might, by spirit over body, of which our present enemies are woefully ignorant, even though they have penetrated nature's cold, material facts.

Nature-study teachers are at last coming into their own. No longer do we hear ironical expressions about "the nature-study fad," or fictitious anecdotes about the teacher, herself. We are now part of a rational scheme of education. Critics are beginning to realize that they are missing something. They who have scoffed and resisted have found themselves in the condition of a small boy of my acquaintance who was anxious to learn to read, just because a little neighbor girl, younger than he, could read well. He labored faithfully. Sometimes, when she was reading, it seemed as though he could not endure to have her do it so well. Finally, one day he threw his book on the floor, crying, "It's no use. I'll never catch up with Martha, because when I catch up with her, she won't be there."

The children and their teachers are marching right along, and with enthusiasm. Vagueness is a thing of the past, thanks to our leaders. Teachers are learning that to teach a nature-study lesson is merely to see the thing the child is interested in, to talk about it and enjoy it with the child, allowing freedom that comes with the enjoyment. In fact, we might say that to teach nature-study is to humanize science, giving it the warmth of the child's interest. It is to create a background against which lives may be built with knowledge of the Divine plan.

The gift of the love of nature has been bestowed upon us all. It is akin to the touch of the Infinite. Little children, being near the source, possess it in large measure. To the nature-study teacher is given the privilege of keeping it alive and of causing it to take root and grow, making life sweeter and deeper for untold thousands.

The Correlation of Nature-Study in the Platoon School

Julia Shourek
Pittsburgh, Pa.

Much has been said concerning the economic possibilities of a platoon school which has been used with much success to relieve congestion in over crowded districts. A school designed for the accommodation of a certain number of pupils can, under this system of specialized work, care for a group of nearly twice the size with the added advantage of having each branch better taught than could be possible in the traditional school. The possibilities of correlation under this system are great. The fact that these schools are located in congested sections makes the possibilities of nature-study seem rather small, and yet it is under such a system that nature-study may have the broadest possible interpretation and correlation. At the McKelvy school where this system is being used, the Nature-Study department forms a centre from which much other work radiates. A corps of three teachers is employed one for the first and second grades, one for the third, fourth and low fifth, and one for the grades above.

Throughout the work runs a definite plan so that the work of the intermediate grades is based on that done in the primary and the work of the grammar grades, which in the seventh and eighth years takes the form of general science, is based on the foundation laid down in the intermediate grades. The nature-study work with very little exception is limited by local conditions. The pets and pests of the household, the trees on the streets, the weeds in the vacant lots, the insects injurious and beneficial, and the plants of conservatory and garden as well as the shrubbery from the school grounds form the basis of much of the work.

The work of the primary teacher combines art and music with the nature-study. The daily forty-five minute Nature-Study periods were found too long for the little children and the correlation has proved very successful. Each subject has been helped by the combination. How many times do our primary children sing songs of dandelions, butterflies or maple trees and realize nothing from the song except the rhythm? But if the mpale tree is seen on a trip to the reservoir or to some other point of interest, if its leaves, bark, size and shape are discussed, if free hand cutting

of leaves make a part of the art work, with color added and the leaves pasted on a bare branch form a splash of color for a gloomy corner—then a song of the glory of the golden crimson leaves of the maple tree mean something to the singer. A rather good example of this occurred when an eighth grade was studying the heavens. A girl remarked "We sang a song in the fourth grade which never meant any thing to me before but now I understand it." The words of the song were repeated:

The man in the moon who sails in the sky
Is a most courageous skipper,
But he made a mistake when he tried to take
A drink of milk from the dipper.
He dipped it into the milky way,
And slowly, cautiously filled it;
But the little bear howled,
And the great bear growled
And frightened him till he spilled it.

Every child in that class had had the song in the fourth grade and not one had ever understood a word of it before.

The flower study in the primary grades are later used in the drawing or painting lessons or may be personified in a little play. The "Flower Babies" as the spring flowers were called in a recent pageant were all personified by first and second grade children.

The animals studied are permitted the freedom of the class room and furnish models for embryonic Michael Angelos who model them in clay. Their queer pranks are retold in the form of oral composition or are the subjects for exercises in paper cutting. Guinea pigs, a duck, a ground hog, a dog, pigeons, and a sheep have each had their place on the program and each has been the incentive for song or story and each has posed as a model for work in the art classes.

In the intermediate grades the work is a little more fully nature work with the other activities growing out of it. The animals studied are classified as to their characteristics as fur bearing animals, animals that hibernate, those that make good pets and so on. The trees of the district are studied and charts made of their fruit and leaves; the life histories of the common insects are worked out and their economic values discussed, and field trips are taken and the weeds studied. Each fall the jimson weed causes trouble among small children in conjested sections. Last fall a study of its dangers was made and a campaign was conducted to

eradicate it in our section, a civic activity which very nearly wiped out the pernicious weed in our neighborhood.

Much reference material is brought from the Carnegie library by this group and the children are trained to find for themselves the subject matter dealing with the work in hand. Such material is later read aloud for the benefit of the rest of the class. This work has acquainted the pupils with many books and is teaching them how best to use the library. When good illustrations are found they are often copied on the board by a child who has a gift for drawing and many a boy who has no real liking for the regular work of the school finds a place where his love for drawing has a definite value.

A most interesting project was worked out by these children this fall in connection with the movement for food conservation. Two classes studied wheat and the cereals which might be substituted in this country so that the wheat might be sent abroad; another group made a series of food charts showing what substitute might be used to save the fats, sugar, meat and wheat. A third group brought materials for an exhibit while the fourth made up an illustrated booklet to go with and explain the exhibit. This work involved a study of foods their values and sources and included nuts, fruits, grains, fats, sugar and meats.

The work proved fascinating and the exhibit was interesting as well as instructive. It has been borrowed by the Carnegie library and is to be used in the branch libraries for furthering the work of conservation.

Such work involves much correlation. Language, spelling and oral expression are the chief studies concerned but arithmetic and reading are used to some extent. The making of artistic chart illustrations for compositions, and blackboard drawing bring in the art work while the assignments from the library teach a use and an appreciation of books. Many stories suggested by the various kinds of work are recommended and in this way the children become acquainted with literature.

The garden work is done in the fifth and sixth grades. What better correlation could one wish than that which is developed between the garden and the school? Arithmetic is involved in the measuring of the garden, in its planning, in the ordering of seeds; and again in the final estimate of the amount and the value of the crops. Manual training coöperates in the making of garden pegs,

the building of tool racks, plant supports, seed flats and animal houses. At the present time a tool house with concrete floor and foundation as well as a concrete runway for rabbit and guinea pigs is being built by the eighth grade boys. This project has furnished material for problems in volume, surface and proportion.

The garden furnishes material for composition which of course also involves spelling; it furnishes both form and color for the art work. This fall all garden products taken after September first were turned over to the domestic science department where they were canned or dried for use during the winter. The work created such an enthusiasm that even boys had canning classes. Nearly three hundred jars of vegetables were put up from the garden. This work was in line with efforts made for the conservation of summer fruits and vegetables.

In the sewing work where fabrics are used the study is made of textiles. The garden classes planted flax and cotton in order to study the fibers. Our cotton crop was a failure but we had cotton bolls from Augusta and we have raised a sheep for the study of the sheep itself as well as its wool.

Geography is the study most commonly correlated with nature-study. Many times nature-study is geography. Winds, seasons, forms of land and water, sedimentation, and erosion—all these are phases of nature-study. When animals are studied in the nature-study department the characteristics of the various animal families are established and the fauna of the various countries studied in geography means more to the child than merely a page of illustrations. Work done on plants does the same for the flora besides laying a foundation for the study of botany later.

In the grammar grades we take up general science which is, in most cases, merely a more systematic form of nature-study. Here we aim to have the child see nature as a great organized power which contributes to our progress and happiness. I have found some difficulty in making a definite outline to follow in these grades. I know the range I wish to cover but find that if the subject in hand seems to be of the child's own choosing a greater interest is manifested and better work done. Each class is asked at the beginning of the term what they wish to take up as the foundation of the term's work. Naturally the studies are based upon some work previously done.

Oil, gas and coal have proved a very popular topic; this of course

necessitates a slight study in geology, and considerable work in geography besides creating a very definite correlation with the kitchen whether at home or at school. A class which wanted to know what happened to the food we eat has made a study of the types of food, has analyzed a piece of bread, studied yeast and baking powder and their actions as leavens and has thus made an acquaintance with the lowest types of plants, and has had an introduction into the chemical action of gases. In connection with this study, we have been able to bring in much work on the care of the teeth.

And so the work goes on. A lesson in nature-study which does not function in some other branch is almost an impossibility. Every effort is made to make the nature-study department a clearing house for the questions which arise in the other classes. Every subject then, which is taught in the platoon school, finds some material for correlation in nature-study and each one can be used for the expression of some of the great truths of nature which is after all the heritage of the child.

Eternity's Stair

JAMES G. NEEDHAM

I have not long to live;
  How shall I spend my days?
How shall I seek from out life's maze
  The profitable ways?
If I could take my toll of wealth
  Would I but fear to lose it?
If I could gain my meed of power
  Would I have time to use it?
If fame, or high command were mine
  Would I be wise to choose it?

The rills run to the sea;
  The leaf shines in the sun;
The earth is full of flowers and bees—
  Of these I am but one;
If a sweet flowery glade is mine
  I must not then abuse it;
If a contented hive is mine
  I must not then confuse it:
No: I must love, and work, and give;
  Who saves his life must lose it.

Some Mechanical Aids in Nature-Study

William Gould Vinal
The Rhode Island Normal School

That there should be artificial devices for teaching nature-study ideas seems rather contradictory. The writer fully realizes that mechanical aids are powerless to educate but believes them to be convenient tools for the skilled workman. A large supply of nature-study machinery, therefore is not to be confused with progress.

Originality is not claimed for the following schemes. Some are inherited with various changes from past instructors while others are the sum and epitome of several years of experience. Such well known contrivances as the germination box with sloping glass front to exhibit root characters are not included in this article. Stories and anecdotes to illuminate certain points, as in the case of the noted scientist who made the difference between the terms specie and species clear by saying that specie is something with which biologists have little to do, are left for a separate sketch.

General Aids

1. *Aquaria.* The salt water aquarium should be used to a greater extent. Sea-salt may be purchased or obtained by evaporation of sea water. Sea lettuce (Ulva) may be floated on the surface by means of corks. Do not over-populate the jar.

A metal plug with a pin-hole bore, placed in the opening of the faucet, makes a fine stream which is excellent for a ration.

2. *Blackboard.* Linoleum, framed and reënforced at the back, makes an excellent blackboard.

Wires stretched along the top of the blackboard and also five or six inches above the ledge are very serviceable. The latter is convenient for holding pictures on the sill. The pictures can be placed there or removed very quickly without injury by patent fasteners.

Frames the size of the blackboard sections, covered with cloth, can rest upon the sill and be attached at the top by means of screw eyes. These are useful for pinning on clippings, announcements, etc. They are also handy for exhibitions. Fall fruits look very attractive when pinned upon them.

3. *Calendars.* The spring calendar is made in the following form:

WASHINGTON COUNTY											PROVIDENCE. Etc.	
BIRDS				TREES				FLOWERS		Other Signs		BIRDS	
Name	Date	Nest	Young	Flowers		Leaves		Name	Date	Date	Sign	Name	Date
				Name	Date	Name	Date						

Since our girls come from all parts of the state we are able to have a competition by counties and by classes. The observations are written upon a blank form, as:

Name of collector .....Class .....
Object.....Date .....
County.....City or Town.....Locality.....
Remarks .....

These slips are dropped into a box made after the fashion of a letter box. Each day the observations are entered upon the calendar. The first blue bird reported in Providence County is credited to that county and to the class of which that student is a member. The class records are kept distinct by using a different colored ink for each class. In graded schools the competition might be by districts, between classes, or between the boys and girls. The whole thing can be taken charge of by the pupils.

The numbers upon the monthly calendars may often be used in nature-study, as in labeling specimens for identification. I always save each sheet as I remove it.

4. *Examinations.* Examinations which invite cramming have no place in nature-study. The true test of knowledge of transplanting, making cuttings, grafting apple trees, etc., is in the success of *doing* the thing. Unlike most examinations the nature-study test means *observation* at the beginning rather than a written paper at the end of the course, as—Note the direction in which the "leaders" (Top shoots) bend on the pine trees of the vicinity. How account for this? Rather than,—What *did* John Smith *write* about the trees in his first chapter?

There are three forms of examinations which I commonly use in Nature-study: (1). *The five minute quiz.* Questions are asked to test whether pupils have worked out the assignment. (2). The *Identification test.* The identification of flowers, shells, etc. The point of view in this test is different from other subjects in that it

is to show what one knows rather than to find out what they (cannot?) stuff in for the occasion. This is shown by writing of two lines of figures on the board, the top line for instance representing the number of shells and the lower line respresenting the number in the class recognizing 10 shells, 11 shells, etc. Each pupil is thus able to see how he stands with the average, the lowest, and the highest of the class. To facilitate the mechanics of these two tests I have slips of printed paper with twenty lined spaces which are numbered as:

1.....

2.....

3.....

etc.

The questions require one or two-word answers. By holding the papers beside a correct copy the mistakes are soon noticed.

(3). *Power to do.* In this type of examination the questions may be answered by the use of notes and text. Suppose the class has studied the seeds and seedlings of the bean, squash and corn. To test the power gained in this study the pupils may be given peas and pea seedlings, to work out independently without suggestions. It is not knowledge but the use of knowledge that is power.

5. *The making and uses of a hectograph.*

(1). Obtain a rectangular tin about an inch deep and an inch larger, each way, than the paper to be used.

(2). Measure the pan with water to see how much material is needed. (3 oz. powdered gelatine, and 1½ lb. glycerine) to ½ pt. of water is sufficient for a hectograph 9 x 12 inches in size.

(3). The proportions are 6 oz. of ground white glue to one pt. of glycerine. (Gelatine may be substituted for glue. It does better work but does not last as long.)

a. Add a little hot water to the glue and dissolve in a double boiler to prevent the glue from burning.

b. When thoroughly dissolved add the glycerine.

c. A few drops of carbolic acid will prevent the pad from moulding.

d. If too soft, melt and add more glue.

e. If too hard, melt and add more glycerine.

f. If there are bubbles on the surface, prick with a pin.

(4). If surface becomes rough set in moderately warm place, as on the radiator. Pan must be level.

(5). Make writing or drawings with hectograph ink, and a heavy pen on hard paper. Make a broad line.

(6). Allow ink to dry. Do not use a blotter.

(7). Dip a sponge in cold water. Press nearly dry. Moisten surface of the pad.

(8). Place written sheet of paper, face downward on pad. Smooth paper with hand so that all parts stick to the pad.

(9). Leave paper on pad for about three minutes and then gently remove.

(10). Moisten the pad again.

(11). Place a sheet of hard paper on inked surface and smooth it as in original copy.

(12). Remove the paper carefully and repeat the process as many times as desired.

(13). If the pad is covered with strips of paper to the edge of the writing the paper used in copying can be more easily removed.

(14). When through copying, wipe the surface with a sponge dipped in slightly-warmed water.

The uses of the hectograph pad are too well known to dwell upon. Test slips, blanks for calendar observations, outline drawings of birds, shells, etc., are useful for identification sheets, for coloring, etc.

7. *Material.*

(1). Shoe boxes labeled on the end, arranged alphabetically, and stacked as in shoe stores, make a systematic arrangement for storing dry material such as: seeds, varieties of corn, leaf stems of the horse-chestnut, bayberries, etc. This material lasts year after year and is one of the best nature libraries. Anything that does not pay rent by being useful at least once a year should be delegated to the waste basket.

(2). Mounted birds, preserved specimens, etc., are numbered and a corresponding number is placed on the shelf so that whenever they are taken for class work or as loan material they may be returned to their particular niche.

8. *Pictures.*

Picture study does not take the place of field work. The

highest inspiration comes from seeing the actual place or object. Pictures necessarily take the foreground when speaking of the Big Trees of California and the scenes of the Yosemite Valley. Such important lessons as the Enemies of the Forest, and Uses of the Forest, are made effective by pictures. The Forest Service has a traveling photograph exhibit to be loaned to schools. Pictures of beautiful yards and country homes, taken from such magazines as *Country Life in America*, form an important part in the lesson on landscape gardening. The pupils are given a list of things that show good taste in ornamenting a front yard. They are then asked to pick out the desirable effects and arrangements that are illustrated in the pictures. These pictures are classified and placed in drawers or filed vertically in cabinets.

9. *Plasticine.* This material plays an important part in nature-study. Not many years ago I felt that a drawing was the only sure test that a pupil had seen what he had been studying. In many cases the plasticine has supplanted the drawing. I find that the pupils get a clearer notion of the bean embryo when they make an enlarged model. Plasticine also has the advantage of being in different colors and it can be used several times. The colors are of especial value in showing the annual rings in a tree and how they would look in quartered sections and in other cuts.

Permanent models for the school room may be made out of papier maché. Soak small bits of newspaper in water for two or three days. Stir this mixture until it becomes a thick mass. Varnish or shellac the model after it has dried. The salt and flour model may be made by mixing two parts of common salt to one of flour and then add water slowly until it resembles wet sand. Work this mixture on a smooth board. Varnish or shellac after it has thoroughly dried. Under the present war conditions it is better not to make the salt and flour model. Cement flower pots and bird houses furnish interesting lessons in construction.

6. *Maps.* I find that maps of regions over which we go on certain field trips are most serviceable. On bird trips, for example, the class marks out the swamps, fields, scrub land, etc. Others mark the location in which we observe the red-winged blackbird, the meadow-lark, the towhee, etc. After a few trips they are able to draw certain conclusions and make predictions as to the places where they would expect to find certain species. The best map for this purpose is the enlarged contour map. It can be made from

the government topographical map. It can be enlarged by use of the pantograph or by dividing the original into small squares with pencil lines and then copying the map onto a chart with larger squares. The latter method is more accurate.

10. *Quotations.* I have these printed in large type upon cardboard. They are displayed at various times during the year. These cards should be changed frequently. Such pithy statements as follow are used for the Normal School classes:

"Our children have as much right to be taught to read a roadside as a book."—Slogan of the Sacramento Playground Commission.

"Nature-study is the alphabet of agriculture."—From a NATURE STUDY REVIEW circular.

"Nature-study is the fundamental basis for the conservation of our natural resources."—From a NATURE-STUDY REVIEW circular.

Quotations from the poets are also displayed according to the season, as:

"The wee willow pussies are climbing the trees."

"By the flowing river the alder catkins swing."—CELIA THAXTER

"The redwing flutes his o-ka-lee."—EMERSON.

11. *Sand Box Gardening.* I consider this the most valuable nature-study equipment that I have. Its use is unlimited.

(1). *Individual Projects.* The box may be divided by cross strings for individual gardening. Each garden is then about 6 x 8 inches in size. Slips of the geranium, etc., may be rooted and transplanted to a pot for Christmas; a series of seedlings may be raised for study; tree seedlings may be raised for Arbor Day; privet cuttings can be started for a hedge; a class exchange of valuable grape cuttings, etc., to be started for early spring; the raising of orange seedlings and the cotton seeds are interesting and suggestive.

(2). *Community Projects.* In this case the strings are removed and groups of students work out certain social and community ideas. All sorts of resources are brought out in this work. Trees may be represented by small bushy twigs which have been covered with a sticky substance and dipped into a box of finely cut green paper. Evergreens may be represented by small twigs of cedar. Green meadows and lawns may be represented by sawdust colored with a green dye. In representing an ideal lawn real grass seed gives a good effect. Tree seeds may be planted to raise miniature shade trees. Color the sawdust with a brown dye to show plowed

ground. Use white beach sand for roads. A mirror makes a clear lake with reflecting surface. Glass over a blue surface gives the effect of a large sheet of water. Animals may be represented by plasticine models. Use cardboard for buildings. Such equipment may be used to illustrate many things, as: The yards of a tidy family and of an untidy family; a railroad station with well-kept grounds; a practical school ground that is beautiful; a miniature rockery, etc.

(3). *Forestry.* For teaching the value of a forest the Forestry Bureau has suggested some such scheme as this: Make a fairly good sized sand-hill. Cover one side with moss to represent the leaf mould beneath the forest. Use twigs of cedar, etc., for the forest. Pour water from a watering-pot onto the hill and note that erosion takes place on the side that has been deforestated. The rapid run off not only washes away the rich soil but would cause floods. These conditions are unfavorable to navigation and to manufacturing. Some of the readers may be interested in two other methods of raising plants, perhaps more of a novel than a practical idea. The wandering Jew may be grown in a test tube of water tied to the curtain string. Cotton batting stuffed loosely in the mouth of the tube will prevent too rapid evaporation of the water. Conch-shell flower pots give an interesting variety to the window-shelf. The use of the egg shell for seedlings is described in Comstock's *Handbook of Nature-Study.*

12. *Written Papers.* Nature-study is one subject which may serve to extend the period of the child's writing and drawing because he enjoys it. One method of killing this natural pleasure is to spread red ink on poorly constructed sentences and misspelled words, and to point out defects in the drawings. I mention this for fear of the misuse of the following scheme. In the concentrated curriculum of the normal school, especially with city bred girls who have had no nature work, and many of whom never saw a "pollywog" or "mushrat" I have hesitated in altogether carrying out what seems ideal. To facilitate the correction of laboratory work I have a series of rubber stamps which read: Make lines definite; label all parts; follow directions, etc. I give them a copy of the rubber stamp readings in the beginning and tell them that my experience has shown the following mistakes so common that I have had rubber stamps made to save time in correcting papers. A few periods result in the almost total disappearance of

these common mistakes. Having once attained a certain standard the pupil is then ready to show originality with a just pride.

Specific Aids

1. *Birds.*

a. The mounted specimen is perhaps one of the first class-room aids that one thinks of in bird-study. There are many accessory objects that may be used. For instance, besides a series of mounted woodpeckers we have: a portion of a dead limb split to show where the grub entered the tree and the hole made by the woodpecker when obtaining his breakfast; an old portion of a trunk to show the abandoned home of the downy woodpecker; a section of the trunk of a white birch to show the drillings of the sap-sucker; a piece of wood in which the California woodpecker stored some acorns. By exchanging with a school in Maine we expect to obtain specimens to show the work of the pileated woodpecker, etc. These are the tools for a live lesson on woodpeckers.

b. *Audubon Charts.* Realizing the risk of breaking two fundamental laws in teaching nature-study, one to study nature afield and the other to avoid drill, I believe that a great deal can be obtained from quick, brief drills with these charts. Besides pointing to the birds for the class to name in unison the teacher may take a book and cover up individual birds and have members of the class describe them. Try the common ones, as—the robin. What is the color of his breast? Where is there white on him etc? This will bring out surprising results for both the teacher and the pupil. Have a pupil face the back of the room and describe the goldfinch.

c. Outlines of the birds made on the hectograph may be colored with crayons. All the sparrows might be drawn on one sheet. Outlines of the birds may also be made by tracing around cardboard patterns.

d. Field work. Besides the contour map the pupil finds it interesting to have a list of the common birds of the vicinity and check off what he saw or heard on the trip. These records are placed on file for comparison with other records.

2. *Fish.* The way a fish rises and sinks in the water is well illustrated by the Cartesian Diver which is explained in any Physic's text-book.

3. *Plants for the Class Room.*

The "*Fern Dish*," so-called, may be any glass dish with a glass top. On the bottom are placed various mosses, ferns, partridge berry, possibly a pitcher plant, and other bog members. The bog is then saturated with water. The moisture evaporates, collects on the glass cover and falls back into the swamp. New plants spring up from the seeds that were in the moss. The "fern dish" presents an interesting center and requires little care.

The following list was worked out by a girl in the Senior nature-study class:—Miss Susie Cooper of Newport, R. I.:

Plants suitable for sunny places

1. Geraniums: old plants or cuttings.
2. Petunia: stalks of old plant cut nearly to ground, plant potted, put in cool place to sprout, then in window.
3. Pineapple: grown by breaking top from pineapple, putting the top in water or sand until rooted.
4. Jerusalem Cherry (Solanum Melvim) decorative.
5. Plants from seed.

   Marigold, "Dwarf French." Bloom after 5 or 6 weeks.
   Sweet Pea, "Earliest of All." Bloom after 10 weeks.
   Sweet Alyssum. Bloom after 6 or 8 weeks.
   Candytuft.
   Lobelia: Plant seeds in spring, excellent for borders of gardens of window-boxes. Transplant strongest of seedlings.
6. Beet, Carrot, Parsley: Ornamental as well as useful.

I. *Plants requiring a medium light (north, east or west windows).*

1. Begonia, rubra: bloom for several years; new plants or cuttings.
2. Abutilon: bloom when quite small.
3. Pandanus: decorative foliage.
4. Coleus: decorative foliage.
5. Sedum, stonecrop.
6. English and German ivys, wandering jew. Suitable for edges of window boxes, or training branches over wire.
7. Cyclamen; bloom best if not kept in very warm place.
8. Cactus.
9. Ferns: dwarf ones preferable.
10. Dracaena: ornamental.
11. Pepromia: ornamental.

12. Primula: Obconica and Chinese. Sow seeds in spring, blossom by December.

III. *Wild flowers suitable for sun or shade.*

1. Jack-in-the-pulpit. Bulbs or corms taken up in fall, potted, placed in window, bloom by Christmas.

2. Mullein: common weed in America. Ornamental plant in England, called American velvet plant.

3. Columbine, violet, taken up in fall, bloom during winter. If wild plants are frozen once, bloom better.

4. Evergreen plants: beautiful window box. Juniper, cedars, pine, arbor vitæ, cypress. Use young plants.

IV. *Plants growing in a weak light (corners of rooms, halls, etc.)*

1. Rubber plants. When frozen, cut back until white sap appears. Keep end bandaged until healed.

2. Aspidistra, "Iron plant."

3. Palms.

V. *Bulbs.*

Bloom from Christmas until Easter.

Plant in early fall, put in cool dark place (corner in cellar or trench in ground), cover with soil; remain there 6 to 10 weeks, then bring to light.

Suitable varieties: Daffodils, tulips, Roman hyacinths, narcissus, crocuses, jonquils.

For growing in pebbles and water: Chinese lilies, paper white narcissus.

VI. *Soil.*

From woods if possible, or a mixture of common soil, loam and leaf mold.

4. *Seeds.*

Mounting seeds for class use is well described in Farmers' Bulletin *580*.

I usually save old paper bags to take in my pocket when out in the fields. One is thus always equipped to gather seeds, etc., which he may wish for class work.

5. *Trees.*

a. *Cross section of a large tree.* This is important to show the time that it has taken our large trees to grow. Important historical dates of the vicinity may be pinned onto the section to show the size of the tree at corresponding times. This makes an interesting correlated lesson.

b. *Tree surgery and dentistry.* A very practical collection of specimens may be obtained for this work by sawing off dead stubs, unpainted wounds which have started to decay, wounds which have partially healed, and those that have healed entirely. Pictures of these specimens and the method of teaching may be found in the Rhode Island Arbor Day Booklet for 1917.

c. *Blocks of wood.* Pine and oak blocks cut and polished to show the annual rings, silver grain, etc., give a good basis for understanding wood structure.

d. *Evergreens.* Obtain a pane of clear window glass of the size desired and a piece of stout cardboard of the same dimensions. On the cardboard place a thin layer of cotton batting. Arrange the evergreens on the cotton in a definite order and place calendar numbers beside them. Place the pane of glass over them and hold the various parts in place by fastening them in a picture frame or by passe-partout binding. This will always be ready for use.

e. A blank for tree observations may be obtained from the Bureau of Plant Industry by sending for form 219.

f. The following is a key for the trees in winter. Similar ones may be worked out for birds, flowers, insects, etc. Pupils are not expected to learn the differences for examination but this form is a convenient way for teachers to identify specimens brought in. The natural way to learn any new vocabulary is through use and should the teacher develop an interest in trees in her students she will eventually find that she is acquiring a large fund of information for herself. In a list of this kind it is taken for granted that the teacher knows a maple tree, etc., but is not sure of the species.

RHODE ISLAND NORMAL SCHOOL

Winter Tree List

Locality ..... Class .....
Date ..... Total .....

YEW FAMILY

*Ginkgo: not evergreen; spurs; leaf scars far apart.

PINE FAMILY

White Pine: 5 leaves in a bundle; cone scales thin.
Pitch Pine: 3 leaves in a bundle; scales thick, spine.
*Red Pine: 2 leaves in a bundle, slender, flexible.

Austrian Pine: 2 leaves in a bundle, stiff, thick.
*Scotch Pine: 2 leaves in a bundle; cones point backwards.
American Larch: deciduous; spurs; cone ¾", few scales.
*European Larch: many leaves in cluster; cone 1", many scales.
Black Spruce: cone nearly spherical, persistent.
*Norway Spruce: cone more than 3"; leaves all around stem.
Hemlock: leaves 2 ranked, whitened beneath, flattened.
White Cedar: leaves awk-like; globular cone; swamps.
*Arbor Vitæ: 2 ranked spray; small tree; hedges.
Red Cedar: bluish berry; dry hills; red heart-wood.
Juniper: berry axillary; leaves prickly pointed, 3 in whorl.

WILLOW FAMILY

Yellow Willow: yellow twig.
*Weeping Willow: drooping branches; ornamental.
*White Poplar; retains whitish green bark; woolly twigs.
American Aspen: buds, reddish slightly sticky, appressed.
Large-toothed Aspen: buds downy, small.
*Balm of Gilead: fragrant buds, resinous, large.
*Carolina Poplar: light yellow twigs; appressed buds.
*Lombardy Poplar: sharply up-curved branches.

WALNUT FAMILY

Butternut: terminal bud longer than broad; brown pith.
Black Walnut: nut spherical, 4 celled; pale buff pith.
Shag-bark Hickory: white, thin shelled nut; shaggy bark.
Mockernut: brown, thick shelled nut; smooth ridges.
Pignut: nut nearly spherical, thick shell; slightly shaggy.
Bitternut: thin shell; superposed buds, yellow, dotted.

BIRCH FAMILY

Hop Hornbeam: fruit like hop; flaky bark.
American Hornbeam: twisted appearance to bark.
Black Birch: dark bark, not peeling, aromatic.
Yellow Birch: yellow bark, peeling, aromatic.
American Canoe Birch: white bark, papery layers.
Gray Birch: dingy, gray bark, not papery.
Speckled Alder: cone-like catkins, lateral, erect.
Smooth Alder: cone-like catkins, terminal, erect.

BEECH FAMILY

American Beech: bluish gray bark; long buds; dead leaves.
Chestnut: burs; 2 ranked buds, oblique to leaf scar.

White Oak: young branches not peeling; large buds.
Swamp White Oak: young branches scaly.
Chestnut Oak: bark not flaky, round ridged; cup thin.
Red Oak: rusty hairs apex bud; large flat cup; flat flutings.
Pin Oak: smooth, continuous trunk; saucer cup; low grounds.
Scarlet Oak: bark gray, red inside; cup conical base.
Black Oak: bark gray, yellow inside; buds pale, woolly.
Scrub Oak: shrub; sterile ground; smooth bark; many acorns.

NETTLE FAMILY

Slippery Elm: inner bark mucilaginous, rough gray twigs.
American Elm: drooping branches; whitish layers of bark.
Hackberry: drupe; chambered pith; galls; bark ridged, warts.
*White Mulberry: many small branches, cut twig milky.
*Red Mulberry: darker twigs; dark margined bud-scales.

MAGNOLIA FAMILY

Tulip Tree: fruiting cones; winged seeds; twigs curve up.

LAUREL FAMILY

Sassafras; twigs aromatic, green, mucilaginous.

WITCH HAZEL FAMILY

Witch Hazel: fruit 2 chambered capsule; flowers in fall.
*Sweet Gum: fruit cluster spherical, spiny; corky ridges.

PLANE TREE FAMILY

Buttonwood: upper trunk white areas; no terminal bud.

ROSE FAMILY

Shad Bush: long narrow buds; berry-like fruit; diseased.
English Hawthorne: unbranched thorns; drupe-like pome.
Wild Black Cherry: develops scaly bark; lenticels lengthened.
Choke Cherry: smooth bark; lenticels do not elongate.
Wild Red Cherry: many small terminal buds; recent clearings.

PULSE FAMILY

Honey Locust: branched thorns; smooth buds.
Common Locust: paired thorns; downy buds.
*Kentucky Coffee Tree: narrow ridged bark; stout twigs.
*Redbud; shrub; flower buds on old growth; ornamental.

QUASSIA FAMILY

*Ailanthus: seed in centre of wing; solitary buds.

CASHEW FAMILY

Staghorn Sumach: velvet hairs; red berries.

Smooth Sumach: smooth twigs; red berries.
Poison Sumach: terminal bud; white berries; swamps.

MAPLE FAMILY

Rock Maple: twigs fork; keys persist; bud sharp, many scales.
White Maple: flaky bark; collateral buds; twigs curve up.
Red Maple: red twigs; collateral buds; usually swamps.
*Norway Maple: ridged bark; red, hairy buds; leaf-scars meet.
*Sycamore Maple: flaky bark; green buds; leaf-scars not meet.
*Box Elder: green twigs; downy buds; leaf-scars V-shaped.

SOAPBERRY FAMILY

*Horse Chestnut: large twigs, leaf-scars and sticky buds.

LINDEN FAMILY

*Linden: buds bright, 2–3 scales show; twigs flat, zigzag.

DOGWOOD FAMILY

Flowering Dogwood: opposite leaf-scars; large flower buds.
Tupelo: horizontal branches; pith partitioned; low lands.

OLIVE FAMILY

White Ash: leaf-scars concave; ridged bark.
Red Ash: downy twigs; upper margin leaf-scar not concave.
Black Ash: scaly bark; black buds.

BIGNONIA FAMILY

*Catalpa: three leaf-scars at node; bundle scars meet.

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*Commonly cultivated.

Tansy

ARTHUR KETCHUM

When by the roadsides, in the sun,
I see the tansy's gold and green,
I know that there in other days
Hearthstone and love and life have been.

There is no need of other sign
To mark the years of labor spent;
For all the dream, for all the hope,
The tansy stands as monument.

In green oblivion the home
Is blotted out, and by the gray
Worn fence that marked its garden ground
The bitter tansy flowers are gay.

The Opportunity for Research in the Problems of Teaching Nature-Study

Elliot R. Downing

We are in the midst of a rapid reorganization of the school curriculum—a reorganization based on a newly acquired body of facts regarding the essential elements in primary school subjects. The educator interested in the elementary school situation is investigating in a scientific way what knowledge of spelling, reading and arithmetic is needed by the average pupil. He is securing the necessary facts on which to base his conclusions by listing the most frequently used words in commercial letters, by a careful study of the literature the child naturally reads at a given age, by determining the various commercial processes that involve skill in the use of numbers. There is universal insistence that subject matter which serves no definite need of the child shall be eliminated from the course.

When it has been determined that a given list of words is needed, a certain reading vacabulary, some definite skill in number work, then the educator of this new scientific type, is undertaking studies to enable him to grade this material according to difficulty, basing his conclusions, not on casual opinion, but on carefully conducted experiment. So there are being developed "scales of hardness" for spelling, reading, writing, etc. We know by careful trial what, children of a given grade, may be expected to do with certain materials, what problems in arithmetic, what exercises in language belong in the upper grades, what in the lower; even more definitely, the scales distinguish second grade capacity from third grade, fourth from fifth.

Furthermore, the modern educator is testing out various methods of presentation of subject matter to determine which is the most effective and is only content when he can measure the comparative results in mathematical terms that carry conviction not to himself alone but to the fraternity at large. Do spelling lessons with words in columns better facilitate learning than those in which words are underscored in the context? Do written or oral problems most promptly give ability to add with accuracy? What unnecessary movements are made in learning to write and how may they best be eliminated? These are types of the problems that are being

attacked and solved by the accumulation of facts to serve as a basis for the correct conclusions.

It is time for the teacher of nature-study and elementary science to be up and doing along similar lines. In fact it is surprising that the teacher of science, saturated, supposedly with the scientific method, should not have been a pioneer with this method, in the attack on the problems of the organization and proper presentation of elementary school subjects, nature-study in particular. But as yet little has been done. There have been some studies of children's interests in nature materials[1], studies of children's perceptions,[2] and of reasoning ability when dealing with science data,[3] some investigations of the relative value of different types of presentation[4] but only enough has been accomplished to show how great a territory there is to explore, how fertile a field of research lies at our very doors.

Let me illustrate my meaning in the concrete. Insect study forms a large part of the usual course of study prescribed for nature work (25%, on an average, of the animal work in nine courses of study analyzed is devoted to the insects). What do grade children need to know regarding insects, using the term need in no narrow sense? Can we settle this question on a fact basis? Broach the problem in a group of nature-study teachers and you will elicit a variety of personal opinions but few facts that will serve as a basis of settlement. The average teacher, even the one who is laboring with the problem of organizing a course of study, is quite surprised that anything besides personal opinion is expected; it requires some time to convince her that such a problem must be settled scientifically on a basis of fact if we are ever going to reach sure foundations in our nature-study instruction.

Again, suppose it is agreed that it is desirable to teach children how plants manufacture their foods or that heat expands most substances. In which grade are the pupils capable of grasping these ideas and comprehending the experiments needed for demon-

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[1]NATURE-STUDY REVIEW, Vol. 8, No. 8, p. 289; Vol. 8, No. 9, p. 334; Vol. 9, No. 6, p. 150.

[2]The General Value of Visual Sense Training in Children, Chang Ping]Wang, Warwick & York; Children's Perceptions, W. H. Winch, Warwick & York.

[3]Notes on Child Study, E. L. Thorndyke, The Macmillan Co.

[4]Teaching Elementary Science in Elementary Schools, J. E. Mayman, Publication No. 13, Dept. of Education, Division of Reference and Research, The City of New York.

stration. To get at the facts that will settle such problems tests must be skillfully made on hundreds of pupils. That they can not be settled off hand on the basis of the teacher's general experience the author has demonstrated to his own satisfaction. Some thirty specimens of snail shells (Polygyra) belonging to several clearly marked species were given to pupils with the instruction to "put all the shells that are alike in one pile, having as many piles as there are different kinds of shells." Lower grade children accomplished the task with a very much smaller percentage of error than did high school freshmen. In another test a small glass flask was used which had fitted into its mouth a rubber cork through which passed a tight fitting open glass tube. The lower end of the tube dipped below the surface of some red liquid covering the bottom of the flask a half inch deep. When the flask is held by the pupil so its bulb is well covered by the hand, the heat expands the air the pressure of which on the surface of the liquid causes the latter to rise in the tube. The pupil is asked to tell what happens and why it happens. Eighty-four per cent. of the seventh grade pupils tested explained the phenomenon correctly, but only forty-one per cent. of the college freshmen. Such unexplained and apparently incongruous results simply indicate that the problem of fitting nature-study and elementary science to the pupils' ability is no small task.

If science is a mass of generalizations organized on the basis of experience, then it is important that the individual should be brought to a grasp of the important generalizations as speedily as possible, equipped to use them and possibly to add to them. Do we spend too much time in merely accumulating sense impressions, in acquiring unrelated percepts? What range of information is already in the mind of the average child in a given grade? It would pay us to find out by carefully conducted surveys that we may know at what stage we may proceed to generalize on the basis of the children's experience rather than repeat what the pupils have already sensed. It is fairly evident from the well-nigh universal statement of the content of nature-study courses in terms of things rather than in ideas that the nature-study teacher is more concerned with accumulating experience than with reaching generalizations. This statement is not a criticism but a challenge. We do not know the ground on which we stand and here is another opportunity for investigation. We must know the content of

children's minds, see what concepts are clear, what material there is present at any level of the school course to serve as a basis for the organization of new generalizations, before we can proceed wisely with our course of study. We need extensive range of information tests.

Enough has been given here to make it clear that we who are interested in effective science teaching in the public schools have a number of scientific problems of the first magnitude to settle if we ever reach correct conclusions on a basis of fact regarding children's needs, ability to comprehend and interest in nature-study material or the best methods of presentation. Fortunately such investigations can be carried on without adding very materially to the teachers daily tasks. She can include in her regular work tests that will help to get at the necessary data and even small contributions will be gratefully received for the field is so large and so little has been done.

February

L. H. BAILEY

February!
The land is in the grasp of winter; and yet
A change is stealing over it
Like a breath of far expectancy
On plowland, marsh and hill;
The sun is higher and lingers at the night
As if reluctant to be gone;
A new blue is in the sky;
The grip of the hard hand begins to relax
And here and there the fingers of the frost let go;
There is an impression of warmth in the thin haze;
The cattle stand longer in the farmyard;
Soft moist colors rise imperceptibly in the woods:
Now and then a new lustre is on the evergreens,
The brown and yellow willows show themselves along the water-courses
And the fire of the osier begins to kindle in the swamps:
We almost look backward to the dead of winter
And almost onward to the rush of the grass—
We look everywhere!

Betwixt the rigid dead-nights of the year
  And the raucous flux of breaking spring,
February lays its faint suggestion here
  And we stand and watch for ev'rything.

Humane Education

There can be but one safe foundation as a basis for the humane treatment of any creature and that is a thorough understanding of its life, its adaptations and its needs. It will be the special effort of the editor in her attempts to aid the teachers of New York State, who must hereafter take up this work, to build up in the child's mind a rational treatment based upon an intelligent understanding of the habits of the animal or bird.

While the editor has very little use indeed as a teacher for the categorical question and answer method of teaching, she has found that this method is in many ways more explicit than any other and she trusts to the ability of the teacher to make the following lesson interesting and vital.

HUMANE TREATMENT OF PIGEONS

Lesson I—How the Pigeons Should be Housed and Why

(Q.) Why must the pigeon-house be mice and rat proof?

(Ans.) Because these eat the food which the pigeons should have. The rats also destroy the eggs and young pigeons.

(Q.) How can the house be made secure against mice and rats?

(Ans.) The walls may be interlined with wire netting, or it may be placed upon pillars or posts which have shelving zinc caps so that the rats cannot climb over and reach the house.

(Q.) Why should the pigeon house be placed on well-drained soil?

(Ans.) Because when the soil is watersoaked the pigeons become unhealthy from walking around in the mud.

(Q.) Why should the openings face toward the south?

(Ans.) Because this lets the sun in in winter and in general there are fewer storms and winds that come from the south than from other directions. Pigeon houses need to be well ventilated and open to the sunshine to ward off disease.

(Q.) Why should the roof of the pigeon house be water tight?

(Ans.) A leaky roof makes the nests damp and unhealthful.

(Q.) Describe the best kind of a pigeon house and make working drawings of this house.

The following pigeon house is advised by Mr. J. C. Long; it will accommodate twenty-five pairs of birds. The house is eight ft.

square on the ground plan, four ft. high at the back, and six ft. high at the front, the roof to pitch from the front backward. The floor is tight, and the whole house is supported on piers or posts a foot high from the ground, and capped with zinc projecting downwards to prevent entrance of rats. The roof may be made of rough boards covered with felt roofing paper, or it may be shingled. In any case, it must be rain-proof. The door for the entrance of the caretaker is placed at one end of the house near the front. Along the front of the house is a window, with eight panes of glass, each pane being 8 x 10 inches. The bottom of the window should be 18 inches above the floor. The window-sill on the inside should be widened by adding a board a foot wide, so the birds may get a sun-bath, which is very necessary to their health. On either side the window is an exit of 6 x 6 inches, with rounded top, and an alighting board six inches wide on the outside, and also on the inside of each exit. There should be four rows of nests at the back. The nest compartments should be made of shelves a foot wide and spaced a foot apart. These shelves should be paritioned with narrow boards into spaces a foot wide. The shelves should be removable so that they may be taken out to be cleaned if necessary. The house is really kept much cleaner if nesting bowls are used. These bowls are made for the purpose, and are sold by the makers of floral pottery for green-houses. However, they are necessary only when squab-raising is planned. There should be five rows of nests along the side.

(Q.) Why must there be an alighting board in front of each nest?

(Ans.) Because when the birds are nesting, the mate has to sit close to the sitter so as to encourage and keep her from getting lonesome.

(Q.) How must the inside walls be treated?

(Ans.) Whitewashed with lime to which carbolic acid is added in proportion of one teaspoonful of acid to two gallons of wash.

(Q). What does this do?

(Ans.) Kills lice and disease germs.

(Q). What should be put on the floor?

(Ans.) Sand, sawdust, or chaff.

(Q.) How often should it be cleaned out and replaced?

(Ans.) As often as it gets foul.

(Q.) Why should leaf stems of tobacco be given the pigeons for nest building material?

(A.) Because tobacco kills the bird lice.

Lesson II—A Pigeon Gymnasium or "Fly"

(Q.) Why do we need a place like this?

(Ans.) If we keep many pigeons we must give them a chance for exercise, where they may be confined if necessary and yet allowed freedom.

Make a working drawing of a Fly or Gymnasium for pigeons. This is not necessary if the pigeons are allowed to fly about the country freely; but it is always a good thing to have in case it is desirable to confine the birds. To prepare the ground for the fly, mark out a space in front of the house 8 feet wide, or just the width of the house, and 14 feet long. Take out all the earth for a depth of four inches, and fill the place excavated with clean sand and place at the corners four 2 x 3 inch hemlock posts, eight feet above ground. These posts should be held in place by 1 x 4 inch boards, nailed to the top and connecting them. One board should be nailed about mid-way the height of the post, and another along the bottom. Space the middle board so that chicken wire four feet wide may be used for the bottom section, and that three feet wide for the upper section. On the inside of the board, at the middle of the post, should be a walking board six inches wide, on which the bird may take exercise. There should be a wire gate at the side and of course the fly should be covered with chicken wire.

Lesson III—Food for the Pigeons

(Q). What grain do we ordinarily feed pigeons?

(Ans.) Red wheat, small Canada peas, buckwheat, hulled oats, Kaffir corn and millet.

(Q.) Why should we not feed pigeons wheat this year?

(Ans.) Because wheat is needed to keep alive the starving peoples of Europe.

(Q.) Why should we feed pigeons neither barley or rye?

(Ans.) The awns of these grains are likely to choke the birds.

(Q.) Why should pigeons have access to salt and plenty of fresh water?

(Ans.) Both are necessary to their health.

(Q.) Why should not large-kernelled corn be fed?

(Ans.) It will choke the birds.

(Q.) Why should we give them green food?

(Ans.) This is necessary to their health just as salads and fruits are good for our health.

(Q.) What sort of green food should we give them?

(Ans.) Lettuce, onion tops, and other tender vegetable leaves.

(Q.) How many times a day should the pigeons be fed?

(Ans.) Twice a day, or their food should be given through a hopper.

(Q.) Describe a hopper and make a working drawing of one.

To make a feed hopper take two boards two feet long and twelve inches wide and one-half inch thick. Take two pieces of the same boards ten inches wide at the top and two inches wide at the bottom and nail them at the ends of the boards making a V-shaped trough with a two-inch slit in the bottom. Place below this a trough six inches wide and two inches deep with standards at the ends. Fasten the hopper above the trough with its narrow bottom about one and one-half inches above the bottom of the trough. The hopper should have a hinged cover, to prevent the wasting of the food. Wires about two inches apart should extend from the edge of the trough to the sides of the hopper. Food may be placed in this hopper and it will fall below into the trough as fast as it is eaten out.

Several of these filled hoppers and troughs should be placed where the pigeons have access to them. Care should be taken that mice do not get into the food; placing the hopper upon a platform supported on a zinc-covered post is one way to accomplish this.

(Q.) Why should we keep pans of cracked oyster shell or gravel and finely ground charcoal where the pigeons can always have access to them?

(A.) They need such materials to enable them to digest their food.

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

THE FOURTEENTH ANNUAL MEETING OF THE AMERICAN NATURE-STUDY SOCIETY

Whoever went to Pittsburgh to attend the scientific meetings held there during the holidays, showed that he had the courage of his convictions and willingness for sacrifice; for in the history of the present generation, the hardships of travel have never been so great as during the last month. Undoubtedly this fact and the extra expense of a journey this year, when ordinary expenses are so increased, resulted in a decreased attendance at the meetings.

The Nature-Study Society meeting was no exception; there was a small attendance but the addresses were of a high order and the business accomplished was considerable. Moreover the sense of companionship in an important work and the exhcange of ideas among teachers taking up the work at varying angles were extremely good for all who were present.

The meeting was convened in a room in Carnegie Museum at 10:30 A. M., January 27th. President L. H. Bailey, having been detained by late trains, was not present and Dr. Elliot R. Downing was made chairman for the day. Officers were then elected.

Dr. S. C. Schmucker was elected president, and retiring President L. H. Bailey was elected to fill the vacancy in the Board of Directors, occasioned by Dr. Schmucker's retirement. C. M. Goethe of Sacramento, California, Wm. E. Ringle, Professor of Nature-Study in the Kansas State Manual Training Normal School, Dr. Elliot R. Downing of Chicago, A. L. Matthews of Utah, and Alice J. Patterson of Normal, Illinois, were elected vice-presidents. J. Andrew Drushel, C. H. Robinson, G. H. Trafton, and R. E. Wager were re-elected directors. Mrs. Susan Sipe Albertis of the Women's

Normal School, Washington, D. C., was elected editor of the garden department of the NATURE-STUDY REVIEW.

Besides the addresses on the program which are published in this number of the REVIEW, there were informal discussions of several interesting subjects. Among them, the Humane Law enacted by the New York State legislature, and its probable effect upon nature-study; and the more important matter, the action of the Conservation Department of the Federation of Women's Clubs, in insisting as a war measure looking to future production, that nature-study should have an equal place with other required studies in public schools. This discussion was initiated by a resolution forwarded to the Nature-Study Society by Mrs. John Dickinson Sherman:

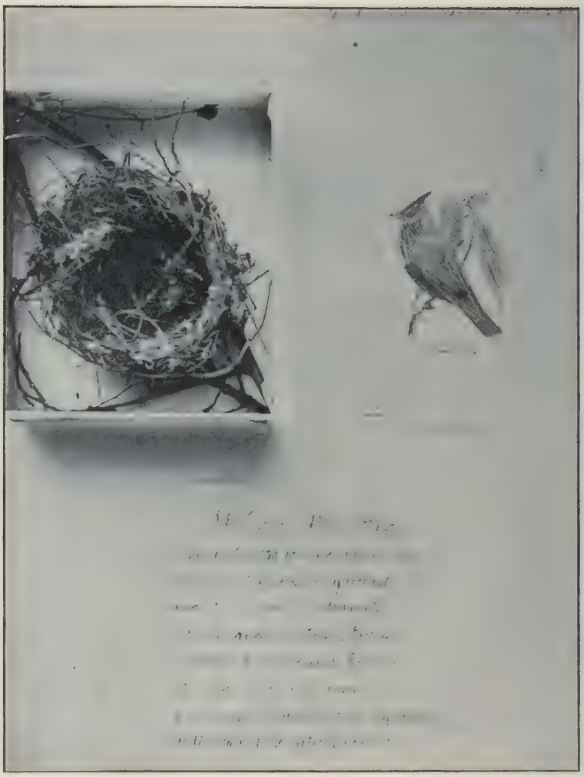
Resolved, That the Federation of Women's Clubs hereby endorse the effort of the Conservation Department of the General Federation of Women's Clubs to have a comprehensive study of the objects of nature in the outdoor world made a formal part of the public school course, to rank with arithmetic, English and history, and for which the pupils will receive full credit.

As a result of a discussion of this resolution the following resolution was passed to be forwarded to Mrs. Sherman.

The American Nature-Study Society at its annual meeting at Pittsburgh, Pa., December 27th, 1917, expressed itself thoroughly in sympathy with the movement suggested in the resolution, passed by the Federation of Women's Clubs; for it has been the object of this Society since its beginning, fourteen years ago, to further "all scientific studies of nature in elementary schools." The Society will therefore willingly coöperate with the Federated Women's Club in any way it can to achieve this end.

A bill before the United States Senate for promoting improvement in rural education, and a bill before the House of Representatives, requiring the Commissioner of Education to devise methods and promote plans for the elimination of adult illiteracy were read, and the Society expressed itself as heartily commending these bills and offering coöperation in securing their passage.

The afternoon session ended with an informal talk by Miss Emma Davis of Pittsburgh upon her methods of conducting nature-study; this talk was full of inspiration and suggestions and Miss Davis has promised to write parts of it for future numbers of the REVIEW. One of the very pleasing events of the meeting was finding Mr. M. J. Walter, who has been quite ill, sufficiently recovered to be present and give us the aid of his advice.



A Cedar Wax-Wing's nest fastened in the collar box and the box mounted on a card, with the picture of the bird in color and a short account written by a Third Grade pupil of Mr. Alfred Emerson.

Teachers' Corner

During midwinter we always experience a sense of alienation from the active life of the fields and woods. Almost all the creatures are so very busy sleeping, tucked away out of sight, that it seems quite impossible to get at them; and if we were to get at them we must surely fail to awaken them. There are just a few of the hardier birds and animals that vivify our snow landscape; and we are so glad to see them that we express our cordial welcome in feeding stations and other protective devices to encourage them.

However, there are several things that we may do in nature study in winter that will bring us nearer to the life which "murmurs and glistens" in June. One of these is a careful study of the bird nests which are so easily found and collected from the leafless trees. Mr. Alfred Emerson, Jr., who has been most successful in his nature-study teaching with young children, has devised a special method of mounting and studying these nests. He found that fastening the nest upon cardboard for exhibit was a difficult proceeding and usually resulted in injury to its structure; therefore he invented the plan of mounting the nest in a shallow box. He sought a haberdasher's establishment and procured empty collar boxes which were just the size needed. The nest was fastened into the box and the box was easily and firmly fastened to the corner of the piece of card board. An outline of the bird that made the nest was colored in crayon and mounted beside the nest, and a short account of the bird and nest was written and mounted below. Since every child chose a different species of bird to thus illustrate, the final exhibit was most instructive, interesting and attractive.

The chief obstacle in the study of winter nests is the lack of information on the part of pupils and teachers as to the kind of bird that made the nest. The best way to meet this obstacle is to encourage the children to note the vicinity of certain birds during the nesting season and after the leaves are off the trees look there for their nests. The following species are easily observed: robin, catbird, song-sparrow, chippy, yellow warbler, phebe, kingbird, and wood pewee. The nests of the vireos and orioles are so characteristic that they may be identified when found.

Mr. Emerson has promised to write for THE REVIEW a full account of his methods of studying winter nests.

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A blue check on the wrapper indicates that your subscription expires with this number.

Human Physiology. A text-book for High Schools and Colleges. By Percy G. Stiles, Assistant Professor of Physiology in Harvard University and Instructor in Physiology and Personal Hygiene in the Massachusetts Institute of Technology, Boston. 12mo. of 405 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1916. Cloth $1.50 net.

Professor Stiles has given us another admirable text book quite up to the standard of his *Nutritional Physiology*, and *The Nervous System and its Conservation*. This volume on Human Physiology is one in which we may study ourselves and find interesting reading on every page. Professor Stiles has the unusual gift of writing entertainingly without sacrificing clearness or conciseness. The book begins with the right sort of a dedication: "To My Father, Edmund Ely Stiles, a Dauntless Optimist," and there follows a few pages of practical suggestions to the teacher. This is followed by chapters giving an outlook over the field and a brief discussion of plants and animals. After the chapters given to the usual subjects in human physiology, there follow important and interesting chapters on metabolism, the excretions, the requisites of diet, the hygiene of nutrition, the maintenance of the body temperature and internal secretions. The book is truly educational,—it teaches in a simple, straightforward and interesting manner what the human body is, what it is for, and how to manage it.

Our Dooryard Friends. Sara V. Prueser. Published by The Platform, the Lyceum and Chautauqua magazines, Steinway Hall, Chicago. 204 pages.

This is one of the intimate friendly books written about our common birds. It is chatty and pleasing in style and puts the reader in the proper frame of mind to observe for himself the interesting performances of his dooryard friends. The volume includes notes on the habits of more than thirty bird species and here and there gives a chapter evincing deep feeling and appreciation of the changing beauty of the seasons. The author made her observations in the region of the Maumee River and in her preface states, "Little less than a century ago, Henry Rix bought a tract of land for which he paid the government $1.25 per acre. It is on this old tract, a part of the original Northwest Territory, from which nearly all the observations, reported in this volume, have been made.

In writing these sketches, my purpose has been to interest both young and old in the life and beauty of the out-of-doors. And in endeavoring to do this, no effort has been made to contribute anything to science but I merely tried to tell the truth as I saw it. If others in their observations of out-door life should verify these truths the writer's happiness will be all the greater."

This pleasing and helpful little book is well illustrated and has an interesting introduction by Brand Whitlock.

Exercise and Review Book in Biology. By J. G. Blaisdell. World Book Co., Yonkers, N. Y., 1917.

Pages 152, of which 10 are devoted to introductory exercises (mainly chemistry), 36, 19, and 32 pages to animal, human and plant biology, respectively, 10 are left blank for additional exercises, and 36 are devoted to reviewing. There is a single 8″ x 10″ page provided for the record of each laboratory exercise, and the materials, procedure and form of the record are in general fully prescribed. A few figures are included. These are mainly of apparatus to be set up, tho some are outline structural drawings, ready to be labelled. Two outlines for field work are slipped in under Review Exercises at the end, for observations, one on animals and the other on plants in nature. These two are better than nothing at all.

The book is an attempt to promote efficiency in the teaching of high school biology by means of a complete and perfectly definite program of work for the pupil from the beginning to the end of the course. In subject matter it is entirely orthodox at the present time. The work outlined is excellent and practical; it is time saving rather than time serving. But one may doubt the adequacy of many of these pages to contain the work that a bright pupil will do on some of the subjects assigned, and the five bird studies offered under Animal Biology provide for no more advanced work on birds than many nature study pupils will have done in the lower school grades.

This program, like that of most high school books in biology, is drawn up for city conditions, and entirely neglects the wealth of biological opportunity that is available in country places. Immense city high school classes may doubtless be more easily handled by such aids, and kept moving forward in lock step from registration up to the Regents' Examination, which is becoming, alas, ever more the chief end and aim of school life. It may be doubted whether from such a cast iron mould there will be turned out those having greater interest in biology, or better ability to deal with biological problems. If this new vehicle be used by the teacher as a wheelbarrow to help along with his burdens, rather than as an omnibus to get inside and to stay inside, then its use may be productive of excellent results. J. G. N.

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VOL. 14 No. 3 MARCH, 1918 Whole No. 116
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THE
NATURE-STUDY REVIEW

VOL. 14 MARCH, 1918 No. 3

School Gardening—A Force in Civic Training

FLORENCE G. BILLIG
State Normal School, Emporia, Kansas

We hear a great deal in these days about the "Town Beautiful." Gradually through the potent influence of magazines and interest in sanitation, the delight in well kept homes and lawns has grown until what was formerly the individual's pride in the yard and garden, has become a matter of general interest and civic pride in beautifying the town in general. No greater influence in inculcating this civic pride has made itself felt than that coming from the schools where gardening has gradually come to hold a fixed place in the school curriculum.

A class in school gardening is a group of girls and boys working as a community. Each child is responsible for his own success and at the same time must help to meet the problems which are of vital importance to the group as a whole. Thus, the children receive their first lesson in co-operation.

For example, the general plan of the school garden must be such that the arrangement will be advantageous to each individual and at the same time present a pleasing general appearance to the eye. To make this possible, those children cultivating tall and coarse-growing plants should select plots in the back of the field. The garden beds should extend in a north and south direction in order that the best light and sun relations will be furnished to the plants. Proper drainage must be arranged satisfactorily to each gardener, in such a way as not to interfere with the plans of the others. The rights of each member of the group must be respected in every question that may arise.

This co-operative spirit is further emphasized in the planting and care of the gardens. It is the duty of each young gardener to keep his paths free from weeds and debris, to allow no weeds which will be disagreeable to his neighbors to go to seed and to

avoid over-reaching the limits of his garden which would mean an encroachment on the public highway. Trespassing is considered a violation of the law. To understand fully what is meant by trespassing, the municipal or city ordinance concerning the penalty of trespassing are studied. In this way the children are brought into contact with civic law.

A sense of responsibility for the success of his work is stimulated in each worker. He is able to put a value on himself and on his work; to recognize the relation of cause and effect, that as a gardener hoes and plants, and weeds, so will he reap. Thrift and responsibility are further emphasized in the care of garden implements. Spades, hoes and rakes not carefully cleaned will rust thus causing loss of time and an unnecessary expenditure of energy in getting them back into working condition. One experience is sufficient to teach a thrifty girl of boy the handicap and actual loss of time resulting from careless handling or neglect of his tools. While it may be sometimes necessary to share tools with a neighbor, the borrower should feel responsible for returning them promptly and in good condition as soon as he is through with them.

Again, gardening tends to promote the right attitude toward work in general. The children work side by side not merely to learn to hoe, to rake, or to pull weeds but to hoe, rake or pull weeds as a necessary means to grow strong healthy plants that will produce profitable results; results that are tangible and easily recognized in the profusion of color and abundant fruitfulness.

This out-of-door exercise and close contact it brings with the physical forces of the earth develops strong, healthy-minded boys and girls which is the first requisite to good citizenship.

However, gardening should not be regarded as simply a part of the school routine; as something the child is obligated to do to make a grade. It should be carried on as a business undertaking. To do this, it is necessary to make a study of the methods of renting practiced in the community in which the work is being done. In the case of our own school, the ground and implements are furnished by the school. The child furnishes the labor and seeds, which can be secured free of charge by writing to the Department of Agriculture, and receives one-half of the produce, the other half, or its equivalent, going to the school fund for the purchase of new garden equipment.

When the vegetables are ready for use, the markets are studied in order that each child will learn the best way of preparing his products for sale and what to expect for them. It is just that he should receive the same price for his goods that the city merchant does, providing his products are of the same quality. In order to secure this price, the vegetables must be cleaned, arranged, and delivered to the home of the consumer in good condition. To carry on this work effectively, a school market should be established. In this way, these young gardeners are getting their first business training and a careful reckoning of the loss and gain involved. Thus again, he has received a lesson in business thrift and enterprise. And when he has deposited his surplus money in the School Savings Bank, which in our own school has been established in connection with the arithmetic work, he has received his third lesson in business economy.

But to make school gardening really worth while, it must extend into the life of the community. The home surroundings should be more attractive as a result of the work at school. Thus the school garden has served its first purpose in the development of civic pride. To encourage this, the eighth-grade girls in our school have home flower gardens. This home work is carried on as regular school work during school hours. Careful consideration is given to the spot to be decorated and the type of plant best suited to it. The aim of each girl is to beautify her own home surroundings. In this connection, she will be governed by the same principles, that governed her school gardening. She must take into consideration the yards of her neighbors and co-operate with them in securing the greatest beauty to the greatest number.

In the same way, the boys should be encouraged to secure vacant lots and go into gardening for financial gain. The plots in the school garden are not large enough for great financial returns but serve as a laboratory where the child learns to do his work in the best and most economical manner, thus receiving training not only for work on a larger scale, but also for his place in the business life of the community at large.

To make school gardening the highest success possible, the co-operation of the various school departments is necessary. In the manual training department, the children make the germinating boxes and stakes and keep the garden tools in repair.

In the arithmetic class, they learn to keep their accounts accurately, determine their financial status, and deposit their money in the Bank. In the English class, reports of the work may be written for the school paper.

School gardening, by its very nature, cannot be separated from civic training but must go hand in hand with it. It not only gives opportunity for the development of the mental, physical and social side of a child but in the training it affords in co-operation, in the recognition of the rights of others, in arousing the sense of personal responsibility, and in cultivating habits of activity and painstaking care to say nothing of the business training before mentioned, and moreover, it insures a development of civic pride in the "Town Beautiful" which is coming more and more to be an important factor in the success of town life. It affords the child vital training in citizenship.

The Woodlawn School Gardens, Portland, Oregon

Nature-Study for the City Child

Anna Allen Wright
Ithaca N. Y.

It is in the grammar schools of our large cities that there is the greatest need for work in nature-study. Furthermore, it is the child in the crowded sections of the city that most needs this help in his life. The country child has the beauties of nature always around him, and he who wants to know can readily find means of learning about the buttercups or the fringed gentian, the sheep or the cows, the bluebird or the chickadee. The city child sees so little of such life, and this little so superficially amidst the noise and clamor, that he is likely to grow up without a thought on these matters, and, in fact, with real thoughts on but very few subjects.

Our parks are few, widely separated, poorly located for school purposes, and often appropriated for public buildings. Our open spaces, once grass-covered, have become either sites for monuments or concrete passage-ways. Especially is this true in the crowded sections where a park could best accomplish the most. The open lots, when they do occur, are so badly beaten by passing workmen and the baseball enthusiasts that almost nothing can grow. The school grounds are gravel; the trees are few; the flowers fewer; and in most places hardly a "weed", dare show its head. No open vista or distant sky line here—just street cars, telegraph poles, and grocery wagons.

Let us broaden this outlook: Comparatively few city children know what such common things as toads and grasshoppers are. It is rather pathetic to see those who want to watch them, catch them in some distant "vacant lot" and carry the grasshoppers home in a jelly glass or the toads in a paper bag (with unlooked for effect on the bag). Something is fundamentally wrong, when the old fashioned aquarium, changed into a terra-aquarium—with water, fish and a turtle in one side and in the other large ferns—elicits the remark, "It looks like somebody was dead." Did the aquarium look like a coffin or was the most intimate knowledge of plants gleaned from funerals? It would be hard to say just why the childish mind associated these things, but such was the condition—a rather dampening one to the teacher's ardor.

Then, again, one feels the unconscious longing of the children when, taking them into the country, a little girl holds up a flower and says, "See how pretty it smells," or taken even to the park, she says in a shocked voice as she pulls the teacher's dress, "She's stepping on the grass." How much such little incidents tell to one ready to understand them. The "tin-can lot" and the water in the gutter are such poor substitutes for the glories of the woods, the meadow and the brook in all their springtime gladness. Can we expect the child who has grown up with the need of always closing his eyes to his surroundings to open them understandingly to admire the beauty of the country? The most it can mean to many city boys is an open space in which to play ball without being chased by a "cop", or a shady nook in which to read. Can we expect these boys to hear the small voices of nature? And yet, we owe it to the generation growing up in our cities, to give them an appreciative sense of their dependence upon the country, and thus to give them a better understanding of their own surroundings. Sardines do not always live in flat tins, nor do peas grow in the cans on the grocer's shelf, and yet that is the only form in which many of our city children see them.

Let us change all this. We must furnish some beautiful surroundings; and then, with objects related to the child's every-day experiences, thrown into an imitation of their native surroundings, lead him to associate these common things with their whole life history: the pop-corn in the bag with the plants in the field; the house mouse with its relative, the field mouse; the fish in the market with the fish in the schoolroom; the fish as food with the living, breathing animal in its native brook or lake.

Education must be a process of directed growth. It must make the mind not a memoranda of facts, but the instrument of a personality that appreciates and understands his daily surroundings. It is in this deepening and broadening of the understanding that natural science offers a powerful weapon. Picture two business men halted on a busy thoroughfare. The one scowls and mutters. For him there is but one thing in life—business—always business, and this is now hindered. The other looks around him at the enforced delay and thinks, "The buds on that old maple tree are surely swelling; it will soon be in blossom." Which one lives up to his own personality? The first is what even our

best systems of education tend to produce—an efficient bit of machinery that will fit into some particular place and whirl madly with the whole.

We must ask ourselves, why this is true. Is it not because there is never time for either teacher or pupils to take a look at the whole? All is a mad hurry to keep up with the system. The fundamental three R's have become six or eight. The teacher must now be an expert in modeling, an artist with pencil and brush, a musician, must be receptive to the latest ideas in phonetics or the newest system of writing. By the end of the day she feels as if she had been managing a vaudeville performance or a three-ring circus. Her personality cannot but become subservient to all these, whereas the personality should be dominant, for it is personalities that we would train.

Facing such facts as these, dare we advocate the addition of another subject—nature-study. Yes! Most emphatically, yes; for it will lessen the burden, not add to it, change the point of view, and make all knowledge come from a point touching the life of the child. As already shown, this work arouses the powers of observation and awakens an appreciation of surroundings. In addition, there is no other instrument as powerful to develop individual-personality. The type seen in the second man in the incident is the kind we would train our children to become—awake to their surroundings, keen and alert to all forces acting around them, and their minds receptive to many ideas. It is hard for children to recognize that the improvement of an opportunity is gain to themselves. It is so much easier to sit back with mouths open and have only sugar-coated facts poured in. But such facts do not seem to them to be a part of their own lives, or in any particular related to them. Knowledge to become a part of their lives, must be linked with their own observations. It is right here that nature-study will prove a great help, for it will change the whole aspect of our educational system. There is no better means for training children to observe and then to *digest* their observations than in the natural objects around all of us: for the country child, the babbling brook or the fiery oriole—nature undisturbed; for the city child, the fish of the market or wharf, the fruits or nuts of the store—natural objects in the commercial world. Experience as a city teacher convinces me that we must use this

substitute for the instrument ready to the hand of the country teacher. But in our enthusiasm for the neglected commercial field we must appreciate that the purpose of its use is twofold, first for its own intrinsic value, but also as a stepping-stone to knowledge of the real things of the surrounding country. Such work gives us a new point of view in our study of the brook, the birds, or the animals of the country when the time arrives for looking at them. It gives us a new method of attack, supplies a supplementary phase to what is commonly elaborated as nature-study work. It furnishes a connecting link between such nature-study work and the conditions known to the average city child. Thus to go from the known to the unknown is the only way we can lead the city child to make the life of the country a part of his own broader life.

Most of our children do not know how to see what is around them. Any unusual object in action such as a run-away horse will of course arouse their interest and excite them, but the "setting" might as well be absent. There is always so much going on, so many changes taking place that they never look at one thing long. Little children must be taught either by their parents or by older children to play; shall we wonder that their powers of observation must be trained in other directions as well?

We are branching out and coming to appreciate the good of "trade schools" in teaching the children how to gain a livelihood, and some chance of choosing a more or less congenial one. Do we teach them how to live the broadest life possible while earning their livelihood? Let us help them get all possible pleasure from the surroundings they must see daily!

It is with the common things of daily experience that we must begin on our nature work—clouds or sunshine, curbstone or cobblestone, sidewalk or gravel of the playground, water supply or furnace coal, flies or ants, peanuts or popcorn. Have these things great innate interest? Perhaps not in the present isolated form, but in their natural surroundings each filled an important place. It is our part to furnish these associations, to imitate a more natural state than the streets in our crowded sections will offer us. Let us do this in our schools. We need all possible help in this task.

Come into the room especially arranged for the natural-history study. Here the things around them are made parts of the lives of the children. It is preëminently "their" room. It is a big room with large, low windows. Along one side is a bay with light from above and close-set windows—a small conservatory. Here are many potted plants and vines, hardy vines like smilax at one end, plant boxes to raise seedlings for the garden or lettuce in winter. In one tray are carnation cuttings made by the children or primulas they have repotted.

In the center of the bay stands the "terra-aquarium." This is a large aquarium with low sides, divided into land and water portions. In the water is a little rock landing on which is a turtle, and in the water are several fish. On the land side are some wild ferns, a few wintergreen plants with their bright berries, and "one berries" too. In one corner is a hepatica plant with its dark red leaves and woolly buds ready to open in the early spring. Here are butterfly crysalids, little red salamanders hiding under the moss and perhaps a large spotted one. Here are some small toads and frogs. We have a covering of screening to put over this when need rises. In the spring time we have a jar of frogs' eggs.

In front of the windows on the other side of the room is a window seat, and hanging there is a hanging basket or a bird cage. In one corner is a case of models of various fruits and real ones whenever possible, not merely edible ones like peanuts, nuts, apples, pears, and berries, but those of various trees and smaller plants as well; maple, elm, horse chestnut, poplar, or even the "cheeses" of the mallow. On the charts at one side are pictures of many common vegetables showing how they grow—cabbages, potatoes, onions, carrots; charts of trees showing their shape, leaves, flowers and fruit; or charts of the humble as well as the more pretentious plants, the dandelion and tansy. On the wall are many pictures of animals. On the small blackboard there is drawn a frieze of tulips, or pine needles, a panel of autumn leaves or snowflakes, according to the season. Here we have collections, to the joy of every boy, of stones, flowers or insects. On the shelves of the low bookcases, are nature books and science books to furnish answers to the many questions. Then, too, we have a lantern.

What an Eden this is, you exclaim! What an inspiration to all who enter! But it is all worth while! This room acts also as the

center of supply for the whole school or some collections may serve many schools. Why not have a "loan" museum in connection with the library? Lantern slides may well serve large sections, why not other things as well? Each room always has something from this central supply and can get something different whenever desired. Here all plants can be gathered and cared for during vacations. This one room can have extra heat for zero nights. Both these elements are so discouraging at present to ambitious teachers. Of course for all this there is a director, who can give lessons or help any teacher in preparation. Her greatest work is as helper.

Would you like to stay a while and watch the children working at their tables? While you are here, some child may come in with flies for the turtle. Would you be surprised if it were one of "your own" most troublesome boys, coming in quietly and saying in a suppressed voice, "Miss ———, I got a fly for the turtle?" He will be very careful, for he wants to see the turtle snap at the fly. Miss ——— smiles understandingly, for she has seen this happen many times. She knows that this boy will watch the turtle enjoy his meal, all unconscious that here is something that carries him out of himself and away from his usual teasing ways. He is too busy to be "bad" here.

The director, Miss ———, can give her thought and energy to the care of all these interesting things, for this is her work. She is a "special teacher," trained in the various sciences, and more than that she is one with so deep a love for all of them that to hear her say, "See the flowers on that elm tree," is to look with interest at an object up to this time "merely a tree." Not alone in the care of her special room is she a help, but in having charge of the school garden or in the planting of bulbs. Besides this, she is one with authority, who can co-operate with the park officers. When the gardens in our park systems are prepared for winter, many plants are destroyed that would make very attractive flower boxes in our schools. Often in the re-arrangements of beds, shrubs are taken out that would be given to the schools were there any definite person in charge to give them attention. Here we have a great field for the correlation of our city parks and schools.

How much richness we can thus add to the lives of the children. We would lay the foundation for a much deeper appreciation of

everything in life. How closely we must always be associated with these first great principles. What a delight to have a love for them. All would not care equally for the work, but why should we want them to? We do not want all cut by the same pattern. And at present this is what we do in trying to press each child into the common mould. All would gain something, though for some it would be indirect. Here is greater chance for individual expression. Here is an additional opportunity to watch the children show their natural tendencies, and so aid in guiding them. Let us give the children an occasional chance to browse, for it is then that the much desired *personality* has a chance to develop. The city boy who will grow up wishing to go "back to the farm" will have a chance to gain a few ideas to fit him for such a step. Furthermore, the language of these surroundings will reach those who speak no English. Here they will see real living objects and want to know about them.

Many of the best lessons will go on without a word spoken by the teacher. When this is over, the time will be ripe for the regular lesson. Many things the children can observe and will observe when directed, but other things must be told them. The teacher must have a wealth of knowledge even when she gives but a few facts, and this knowledge must be a part of herself. This was impressed on me in trying to give a fish lesson to a group of second grade children. We had the fish in the center of our little group. Then followed the volley of questions on my part. How does it swim? How does it turn around? How does it breathe? How does it eat? What does it eat? Why does it live in water? Then came the thought, what else is there to see? Perhaps the children learned a little in that lesson. As a teacher, I learned a great deal. The vital part of that lesson could not be expressed in questions and answers. Was that fish a living, breathing, essential part of the lives of those children, or was it merely an object of curiosity set up in a glass dish for the children to observe and, in a figurative way, pick to pieces? The best part came while the children were watching and asking the questions themselves. As a teacher I gained an interesting and educational keynote from the explanations the children gave each other. Sometimes the lessons will be very short. When one has but little material, don't wear that little out, stretching it to cover

a certain period. Many a valuable lesson will often be merely incidental.

A trip to the grocery store will furnish material for many interesting lessons. Which side up did the turnips grow? What part of the carrot plant do we eat? Why do these plants have fleshy roots? What part of the plant is the potato? Do you know that peanuts are like pea pods, growing underground? Why are there so many seeds within a fig and how are they arranged? Where do bananas and pineapples grow? What do they look like in their native surroundings? Why don't they grow in our yards?

Is there a fish market near by? Why does the halibut have both eyes on one side of his head? Why do they scrape fish before eating them? What use are these scales to the fish? Are these fish like the ones in our school room? Do bullheads have scales? What is the difference between oysters and clams? Where do they live? In our nature room we have means of finding answers to all these questions and many more.

What a wealth of suggestive material we "city folk" have at hand. We may have no nearby brook or meadow, but we have many other things instead. We do not have them in the natural beauty of their native state, but we must try to associate that with them, and to do this so closely that our interest avoids the stamp of superficiality. This is the field for nature-study in our city schools.

This work will bring unmeasured joy to the teacher.

My Garden

MARION MCFADDEN (Age 8)

I have a little garden
  Down by an apple tree.
'Tis cared for by God in Heaven,
  As well as little me.
There are many others like it,
  But none so dear to me
As my tiny little garden,
  Behind the Academy.

Nature Study and the School Garden

KATHARINE L. KOEHLER
Hyde Park, Cincinnati, Ohio

It is an acknowledged and much deplored fact that nature study is either very unsystematically taught or is neglected entirely by the majority of teachers in our elementary schools.

That nature study could be made a highly valuable subject of the curriculum is undoubtedly true. The usual course of study does not make the appeal to the thoughtful teacher nor to the average class that the richness of concrete material around us would warrant. The fault is with the poor organization of the material and lack of suggestions of vital projects to present to the children.

To make nature study vital to the children it must function in their every day lives and bring such a wealth of interesting experiences it will rather deepen that aesthetic appreciation so earnestly defended by nature-study enthusiasts.

In a recent number of the *Teachers College Record* (March, 1917) an article by Maurice A. Bigelow states very strongly the aims and purposes of science in the modern school. These same purposes should dominate the nature-study of the first six grades as well as the science of the upper grades and of the high schools. Mr. Bigelow says:

"The modern school, which aims to fit the life of the average intelligent citizen, must soon meet the demand for applied science, for science that fits life. That must be applied science in the largest sense of the word 'applied', namely, science that presents the great facts and leading ideas which touch human life in its combined economic, industrial, hygienic, intellectual and aesthetic outlook * * * Every topic, every lesson, and every subdivision of a lesson should be planned with reference to these two questions: 'Are the available facts in this case clearly of interest, are they applicable, are they significant in the life of the average citizen?' 'Are the materials selected, arranged, and presented with reference to the most efficient teaching of science to the particular pupils at hand?' Upon the affirmative answer to these two questions will depend the fate of science as the claimant for a very prominent place in the curriculum of the modern school that surely is to come."

On this basis why not reconstruct a course for nature-study worthy of all the enthusiastic effort we can command from children who are working on a project very vital to them. The following are some suggestions for such a course.

SCHOOL GARDENS FOR SUBURBAN SCHOOLS

To counteract the discouragements of a neglected school garden during the summer months, when weeds grow rampant and harvests are ungathered, why not start a garden for the nearest neighbor instead of planting one at school? If done painstakingly and thoroughly, and left in good condition in June, the owner might consider it a fair bargain if the garden truck belongs to him in payment for his accommodation. Radishes, onions, and lettuce are about the only products maturing before school closes, but children should also know how to grow beans, potatoes, tomatoes, corn, beets, carrots, and other vegetables as well. The garden should be large enough to plant several different vegetables and enough of each to really count in the way of food for an average-sized family. Perhaps the children might have the radishes, onions, and lettuce in payment for their own labors. Or, if the garden were on the school grounds, could it not be made worth while for some neighbor to care for it during the summer and have the garden truck for his own use?

Home gardens should be encouraged by all means, but so often the home garden reflects the meager planting of the school garden. To in a measure prevent this result, the school garden should be a model of efficiency in every way possible.

So much for the vegetable garden; but when you stop to consider the small proportion of one's own grounds devoted to vegetables and so much larger proportion devoted to lawn, shrubbery, flowers, and trees, we know that our school garden supplies only a part of that education so needed in the life of the average citizen. A knowledge of how to care for a lawn, beautify it, and appreciate landscape gardening either at home or in the parks is another important phase of gardening.

The ideal school garden should be large enough to include a lawn, shrubbery, trees, gravel walks, flowers a bird bath, bird boxes, perhaps a pond for gold fish and water lillies, and a place for pets for the younger children. Enclose the entire garden

with a neat looking fence and high shrubs just within to keep the garden private, a place in which to entertain visitors, to have outdoor plays, festivals, special games, a place to work in, to beautify, to enjoy, to watch the ways of the birds and all other living things cared for there by the children.

PLANNING A SCHOOL GARDEN

The plans for the garden should be the children's work; they should visit various places, in and near the city that are examples of landscape gardening, to get suggestions; they should study such magazines as *The Country Gentleman*, *Country Life in America*, *The Garden Magazine*, garden catalogues, as well as practical books on gardening; they should plan how to keep the garden blooming from early spring until late fall and learn to group flowers for color effects and for plants that bloom at different periods. They should study the enemies of the garden as well as its friends. What are the friendly birds and insects; how do they help us, and how can we help them? What are the enemies of our garden and how can we best get rid of them? This will necessitate series of lessons on various weeds to see why they are so sturdy, their harm and how to get rid of them; or, what birds can we be likely to attract? Why do we want them? How can we keep them happy in our garden? There will also be series of lessons on helpful insects and how they help, a study of their life cycle to see how and when we can best destroy those that are injurious.

Such a garden would include a study of soils, drainage, and plants adapted to that particular environment, reasons for cultivation of soil, conservation of moisture, etc., all for the purpose of producing the best results in that particular place. It would include familiarity with many garden flowers, annuals as well as perennials, shrubs and trees, through selecting and cultivating suitable ones for the school garden. A small greenhouse with potting bench, transplanting facilities, indoor sprouting and forcing of early plants would extend greatly the opportunities for nature-study.

One progressive course of study suggests that each class choose a class tree to study. This tree studied in its different phases, characteristic shape, fruits, leaves, stages of growth and seasonal changes will make excellent art studies for decorating booklets, making class posters, calendars, and programs for different class

activities. This should be a tree either in the school garden, nearby park or neighborhood.

Each class should have its pets to care for. All these various lines of work and many more beside, are the outgrowth of the one big school project—that of making and keeping up the school garden. This one big problem will socialize the work of the entire school, foster a splendid spirit of co-operation, and will supply a motive for nearly all the nature-study, both practical and aesthetic, anyone might wish to have.

Courses of study containing interesting projects for applied nature-study are the Baltimore County Course of Study, and that of the University Elementary School, Chicago. In the Special Course of Study Number of the NATURE-STUDY REVIEW, March 1915, there are many good problems suggested for the children, but there is no big project including many problems necessary for the working out of the whole.

The project in a course of study should be the most prominent item and should dominate the entire organization of material and be so represented that he who runs may read.

Science in the modern school has really made more advances than nature-study. To make either a success, much enthusiasm and hard work are needed; but they pay abundantly for all the energy expended.

Child's Song

THOMAS MOORE

I have a garden of my own,
Shining with flowers of every hue;
I love it dearly while alone,
But I shall love it more with you.
And there the golden bees shall crone,
In summer time at break of morn,
And wake us with their busy hum
Around the Sika's fragrant thorn.

I have a fawn from Aden's land,
On leafy buds and berries nurst,
And you shall feed him from your hand,
Though he may start with fear at first,
And I will lead you where he lies
For shelter in the noontide heat;
And you may touch his sleepy eyes
And feel his little silvery feet.

Members of a Garden Club

School Garden Clubs in Crowded New York City Schools

ANNA M. HILL
St. Mary's Park, The Bronx, N. Y

Three years ago in the early spring circulars were sent to many schools by the School Garden Association suggesting the formation of garden clubs among the pupils, the planting and care of plants during subsequent growth to be classroom or home interest.

In P. S. 121 Manhattan, on the east side, in a tenement and pushcart section, only about fifty children responded the first year. However, owing to a carefully planned exhibit of these few plants the first June, the number of pupils who joined the club and had plants to enter the next year, increased to about five hundred.

Many teachers had little or no knowledge of the kinds of seeds best adapted for this work, and the lack of this information called forth the carefully selected list of suitable seeds and the actual cost to a school of 48 classes, which list is appended to this article.

The seeds and soil were furnished to the children. They brought in a wide and motley assortment of receptacles, boxes, cans, jars, etc. Each teacher took the work of planting as a class exercise in nature-study.

The matter of choosing a name for each club was taken up in all seriousness by the little foreigners, and many and varied were the titles.

All plants were to be cared for at home and brought to school to be exhibited on a special day appointed by a committee of teachers, who also served as judges. The foreign visitors showed great interest, many of them able to communicate with principal and teachers only by gestures.

In the lower Bronx, at P. S. 30, over one thousand pupils exhibited their carefully nutured plants last June.

Most of these were grown and tended at home but some classroom plants, cared for by faithful monitors, were also entered in the exhibition. The clubs in the different classes, chose their own colors and schemes for preparing the plants for exhibition, showing good taste and ingenuity in preparation. Every class, visited this display. Our illustration shows the interest of a first year class in one part of the exhibit.

Some of the older boys had prepared two barrels by perforating at six inch spaces the upper half of each. In one of these barrels, filled with good soil were placed about 35 strawberry plants, and in the second, a subnormal class planted climbing nasturtiums.

Both of these were in prime condition when the exhibition was held, ripe strawberries hanging around one barrel, and the other festooned with vines of beautiful blooms.

A class of 50 first year boys started an eggshell garden. Two roasting pans at 10 cents each, filled with wet sand, held the shells. After these shells had been filled with good soil, each boy planted a pea seed, and wrote his initials on his eggshell. When the vines grew quite tall they were supported by splints and several plants not only blossomed but bore pods of peas.

One fifth year boy who evidently had a bent for landscape gardening, laid out a center bed, paths and side plots, all outlined with agates, in a three inch by two inch box. At one end of the box, on the level of the path he drilled a hole and inserted an umbrella ferule, below which he hung a small can to catch the overflow of water. He was willing to take no risks of having his seeds drowned out.

Before spring growth begins, get a sod of earth large enough to fill a meat pan and place it in a sunny window, keeping it well watered. Ere long you will see things sprouting, and will have the pleasure of trying to identify the various plants.

Remember, Darwin grew 82 different varieties of plants from a ball of mud taken from the foot of a partridge.

Your own fernball may be made by packing a few fern roots from the woods with moss, tying it in the form of a ball, and suspending it in a light place, not real sunny. Every day dip this in water and you will enjoy the result.

These few suggestions may help some teachers and pupils to love and turn to nature-study as many of our greatest men and women did.

Children and the Home Garden Movement

By Dr. R. W. Shufeldt
Washington, D. C.

There has recently been put on foot in Washington a very wide and well-organized movement, making for the encouragement of its citizens, in the use of their small house gardens—such as may have them—for the purpose of raising table vegetables, either for home consumption or for sale. The object is an economic one, in that the living may be better, and the family pass well fed and cared for through the present stage of senseless high prices for food.

In size these gardens run from ten to twenty feet to half an acre or more; and it is truly remarkable how far even a small one will go towards keeping an ordinary family in vegetables for the table—that is, if it be properly planted, managed, and due care is taken of it. Quite recently the public schools have taken up this matter, and the children in all grades are being carefully instructed in the horticulture of the home garden. They are making, as a rule, a great success of it, and it is very gratifying to note the interest children of all ages are taking in it. Miss Susan B. Sipe, who has an important department in one of the largest of Washington's public schools, gave the classes, numbering some 200 children, a talk on this subject on the second of April, 1917, at which, by invitation, the writer was present.

Her talk was beautifully illustrated by appropriate slides. All the various departments of elementary gardening were touched upon, special stress being laid upon the proper way to lay a garden out; what to plant, and when and how; the use of tools; friends and pests; costs and profits, and the rest. On the screen were thrown many pictures showing children at work in home and school gardens; many kinds of flowers and vegetables; the tools used; birds, toads, and other friends of the gardener. During the hour or more consumed in giving this lesson, Miss Sipe constantly put questions to the classes on the subject under consideration, and it was encouraging to note the children's interest in it, as well as the prompt and intelligent answers given—the average age of her hearers apparently being about twelve years or rather less. Miss Sipe kindly handed me for publication in the present connection two compositions by children of that school on home garden topics. The young writers are each about ten years of age, and the papers have not a little to commend them. They show very well the attention they give to the subjects brought before them, and the admirable methods adopted to impart knowledge. These compositions are as follows:

Testing the Soil

If you think your soil is sour or acid, but are not positive, you can find out very easily by using blue litmus paper.

I am sure of this, because we experimented at school by putting a piece of blue litmus paper in a bottle of acid, which immediately turned it red.

We know that acid turns blue litmus paper red, so we can easily test our own soil.

You must take a saucer of the soil that you are going to plant in and add enough water to make it muddy, then put a piece of litmus paper in it. If it turns red, you may be positive that your soil is acid or sour.

Since most plants will only thrive in sweet soil, we must find what remedy we need.

We had another experiment showing how to sweeten soil. Can you guess what it is? It certainly is a treat to the soil.

Well, since you can't guess I will have to tell you. Sprinkle a little lime over the soil.

Since you have put the lime on put the piece of red litmus paper into the lime soil and it will turn back to its same color, blue.

It will take a pound of lime to every forty square feet to sweeten the soil of your garden.

March 29. CATHERINE GRAY.

NATURE'S SOIL MIXERS

Mother Earth always knows a way for man to be helped. I am going to tell a way she has provided for us. In school the other day Miss Sipe brought us a jar half filled with sand and its equivalent in leaf mould on top of it. Then, without mixing the two, we put quite a good many earth worms in it.

We wanted to see what would happen, so we covered it with heavy paper, so that no light—just air—could get to the worms, for we know that they will work only in the dark. This we watered every day. In about three days we began to notice that the soils were being mixed. Why—what do you think?—those little earth worms had mixed that soil—all by themselves. This is one way that Mother Earth helps man.

March 28, 1917. HAZEL CHRIST.

During the middle of April lectures will be given to these classes on birds, reptiles, insects, and so on, that are useful or otherwise to the home garden.

Enough cannot be said in favor of this addition to the teachings of our public schools. If properly conducted and presented it has everything in its favor and is entirely bereft of all disadvantages. It leads to healthful exercise out-of-doors; it instructs children in elementary biology, botany, and horticultural pursuits, and above all it makes for training in the gentle art of correct observation.

"March! March! March! They will hurry
Forth at the wild bugle sound;
Blossoms and birds in a flurry,
Fluttering all over the ground.
Hang out your flags, birch and willow!
Shake out your red tassels, Larch!
Up, blades of grass, from your pillow!
Hear who is calling you—March!"

—LUCY LARCOM.

Cottonwoods or Carolina Poplars

A Study of Shade Trees for Grades Seven and Eight

FANNIE RAGLAND
Oxford, Ohio

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10. Transplanting, Vernon H. Davis, Extension Bulletin, Vol. 7, No. 8, Agricultural College, Ohio State University, Columbus, Ohio.

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NOTE: References 5, 6, 7, 8, 9, 10, and 11 are most helpful in working out this course of study.

A man buys a lot at the edge of Oxford. It is a lot one hundred feet wide and one hundred and fifty feet deep. There are no shade trees on the lot.

Problem: How can this man provide shade for his lot so as to make it most valuable twenty years from now?

1. What trees shall he plant?

(Let the children make suggestions. If they suggest the elm then the question.)

1. Why plant the elm? Why not? Ref. 5, pp. 233–240.
Ref. 6, pp. 230–233.
Ref. 11, pp. 38–41.

(If they suggest that the elm is pretty, makes good shade, is strong, etc., the following questions arise.)

1. Why do you think the elm a beautiful tree in the fall? spring? winter? summer?
2. What reasons have you for believing it to be a strong tree?
3. What kind of shade does it give?
4. What care does it require?
5. How rapidly does it grow?

1. What are the advantages and disadvantages of planting the elm on this lot?

*Conclusion: Solotariff says, "No other tree combines such strength with so much grace." Because of its beauty, strength, and abundant shade it is a great favorite. The elm is beautiful at all seasons of the year. "In summer it rises like a great fountain of green." "Every chink is filled with a leaf." In autumn these leaves turn brown or a golden yellow. In winter we can appreciate the beauty of its arching limbs, pendulous branches,

*In substance children should reach the conclusions suggested.

and feathery twigs as they are outlined against the sky. Many people miss the beauty of the elm in blossom. In the early spring the reddish brown blossoms appear. Then the elm seems to be enclosed by a purple haze. Unlike most shade trees the elm requires little or no pruning. Its strength has been immortalized by Holmes in his "Wonderful One Hoss Shay."

On the other hand the elm grows slowly. It has more insect enemies than most any other shade tree. In the east it is many times killed by the tussock moth and the elm leaf beetle. The elms of this vicinity have not been bothered, but many people hesitate to plant the elm because of its devastation in other sections of the country.

(Someone suggests the poplar and others object at once stating that the council of Oxford has recently passed an ordinance ordering all poplars to be cut down. This raises the question.)

2. Why have the councilmen of Oxford ordered all poplars to be cut down?

(Children suggest that the rootlets fill the sewers, the tree is ugly, dirty, and requires great care, therefore the following questions):

Ref. 6, p. 147. Ref. 11, pp. 22–27.

1. What damage have the roots of the poplars done in Oxford?
2. Why is the poplar called a dirty tree?
3. Why must it be pruned carefully?
4. Why do you think it ugly?
2. Why not choose the poplar for this lot?

Conclusion: In the first place there is in Oxford an ordinance against it, because its rootlets find the slightest crevice in the sewer pipe and fill it in no time. The roots also raise flagstones and crack concrete walks. It os also very dirty and needs much pruning. It is dirty from April until late in the fall. Flowers fall in April, cottony seeds fly about in May, and the leaves fall from June until late in the fall. The wood is so brittle that a slight gust of wind brings twigs and limbs to the ground at any season of the year. The tree requires continued pruning to cause it to spread. In fact the poplar is attractive only when young. If untouched it grows tall; if headed in it is unsightly with its large trunk and small top.

With questions similar to the above and references given the following conclusions can be reached.

3. Silver Maple. Ref. 5, pp. 73–77.
Ref. 6, pp. 371–372.
Ref. 11, pp.19–22.

Conclusion: The Silver Maple is attractive when young. It is symmetrical in outline. Its finely cut leaves hang on such long and slender stems that they sway with the breeze, showing the whiteness of their under surface. In the fall the leaves are a pale or brilliant yellow and scarlet. It grows so rapidly and easily that it is often spoken of as a lazy man's tree. In some communities it is bothered by the tussock moth, bag worm, cottony maple scale, and leopard moth, but in this community it escapes any great damage from insects.

On the other hand the wood of the maple is brittle and weak. The branches shoot out at an angle that makes it impossible for them to sustain their own weight when large. The breaking of the limbs cause work, and worst of all the rough ends decay carrying disease to the heart of the tree.

4. Sugar Maple Ref. 5, pp. 66–72.
Ref. 6, pp. 374.
Ref. 11, pp. 16–18.

Conclusion: The hard or sugar maple furnishes shade slowly. But it is a clean, hardy, and erect tree. It grows well in the shade and so prospers in the midst of the more rapidly growing trees. In this community it is practically free from insect pests. It is in other words a tree to be depended upon. Added to these qualities it is attractive. When young its full leafy head is often a pure oval. The foliage is always dense, and in the fall it glows in yellow, orange, and red.

5. Locust Ref. 5 pp. 97–102.
Ref. 6, pp. 339–341.
Ref. 11, pp. 56–58.

Conclusion: As a shade tree the locust has little to commend it, except its rapid growth, beautiful flowers, and in early spring its attractive foliage. It is angular in form, its branches are brittle, its foliage short lived, and its pods persistent. Many of the locusts of this community are killed by the locust borer. It is no uncommon thing to find the locusts partly dead.

6. Linden Ref. 5, pp. 26–30.
Ref. 6, pp. 394–396.
Ref. 11, pp. 34–36.

Conclusion: The large and abundant foliage of the linden makes it a very good shade tree. It is a vigorous grower and often lives to be quite old. The graceful outline of the linden makes it attractive in winter as well as summer. The linden is at its best before midsummer, for after that time the leaves grow coarse turn brown and fall. It is free from insect pests here but in most places it is so injured by them that it is considered undesirable.

7. Catalpa Speciosa — Ref. 6, pp. 447. Ref. 11, pp. 56.

Conclusion: It is one of the most rapid of the rapidly growing trees. It has a rather compact head. It seems rather hardy, and until recently it has been free from insect pests in Oxford. This last year it has been bothered by the catalpa sphinx. These in turn were so affected by parasites that the second generation did little harm.

8. Sycamore — Ref. 5, pp. 265–268. Ref. 6, 279–281. Ref. 11, pp. 44–47.

Conclusion: The sycamore is hardy and bears transplanting. The shade of the sycamore is never dense for its head lacks compactness. The sycamore is not beautiful. It may be said to be picturesque rather than beautiful. The sycamore is sometimes subject to a disease that attacks the leaves, causing them to grow brown and shrivel up. This seems true of some sycamores of this community. Many of the sycamores grow too large for the average lawn.

9. White Ash — Ref. 3, pp. 774–777. Ref. 6, pp. 432–433. Ref. 11, pp. 49–51.

Conclusion: The ash grows much more slowly than the catalpa, poplar, locust, and soft maple, but it remains straight and symmetrical long after they are ragged. In the summer it is pleasing to look at for its leaves are so attractive. While not compact it furnishes abundant shade. It is not very clean in the fall for it sheds its leaflets first and then its leaf stems. It is free from insects in this community.

10. Pine — Ref. 3, pp. 789–794. Ref. 5, pp. 443–448. Ref. 6, pp. 23–26.

Conclusion: The pine is one of the slow growers. It is an ornamental rather than a shade tree. As such it is very attractive when young. Most pines become very ragged after a few years. This is especially true where snow, ice, and sleet storms are frequent. Even though ragged some of the pines are very picturesque.

NOTE: If in the midst of the discussion some child says, "I do not know the elm" the following procedure can be used in the study of some elm trees of the vicinity.

How know the elm?

What kind of a leaf has the elm?

How know the elm by its shape?

Conclusion: The elm may be easily recognized by its leaf and its triangular outline. Sometimes the trunk soon divides into from two to three main branches, which rise with an easy and gradual curve, become horizontal, and many times pendulous, giving to the elm the Etruscan vase form. At other times the trunks are tall and the branches form a bush at the top, not unlike the feather duster. The elm leaf is an egg shaped leaf two or three inches long. It is known chiefly by its lopsidedness.

(A similar procedure can be used for any tree which the children do not know.)

1. Repeated: From all that we have said of these shade trees which would you select for this lot?

Let children make suggestions. From these suggestions raise the question:

11. Shall we plant slow or rapidly growing trees?

1. Which are the rapidly growing trees?

2. What are the advantages of the rapidly growing trees?

3. Disadvantages?

Partial conclusion: The rapidly growing trees are brittle and easily broken. They are dirty trees, the poplar being especially undesirable for this reason. The catalpa and locusts are bothered by insects in this community. Unless rapid shade is very much desired the fast growing trees are to be avoided.

4. Which are the slow growers?

5. What advantages have the slow growers?

Partial conclusion: On the whole the slow growers, the hard maple, the elm, the ash, the linden, the sycamore, and the pine are hardy and clean. In this community they are fairly free

from insect pests. They remain symmetrical long after the rapidly growing trees are ragged and unsightly.

11. Repeated: What would be your recommendation for this lot, slow or rapid growers?

Conclusion: A combination of slow and rapid growers is best. They can be arranged so that the rapid growers can be removed early leaving the slow growers to furnish permanent shade.

12. Which of the fast growing trees shall we select?

13. Which of the slow growers shall we select?

1. Repeated: Which of the common shade trees shall he plant?

From data already gathered the children will probably come to the following conclusions:

A combination of hard and soft maple so arranged that the soft maples can be removed as soon as damaged, will make a valuable lot.

If the parasites succeed in conquering the catalpa sphinx the catalpa would probably be more valuable than the soft maple because it will furnish shade quicker.

The ash is also a valuable tree.

Aside from the danger from insect pests the elm and linden are most valuable for permanent shade.

2. Suppose the owner decides to plant the hard maple and the catalpa speciosa how shall he do it?

1. How select the trees? Ref. 7, p. 102.
Ref. 10, p. 5.
Ref. 11, pp. 82–84, 87.

1. Where shall he get the trees?
From the woods or the nursery?
From what nursery?

2. What kind of trees shall he select?
What age?
What size?
What kind of top and roots shall the trees have?

2. When plant the trees? Ref. 7, pp. 106–107.
Ref. 10, p. 5.

3. How have in good shape for planting?
Ref. 7, pp. 102–104.
Ref. 10, pp. 5–6, 8–9.

1. How care for the tree until planted?
2. How offset the decrease in food supply caused by the loss of roots?

4. How plant?
   1. How prepare the soil for planting?
      Ref. 7, pp. 105–106.
      Ref. 10, pp. 7–8.
   2. How set the tree out? Ref. 7, pp. 107–108.
      Ref. 10, pp. 9–11.
      Ref. 11, pp. 90–93–95.

      How keep the tree vertical?
      How fill in the dirt?

2. How then shall he provide hard maple and catalpa for his yard?

Conclusion: When buying shade trees go to the local nursery and select from trees one to three years old. Select a tree with compact root system and large top for the age of the tree. Puddle or heel trees in until planted. Before planting prune all mangled roots, and also the top in proportion to the loss of roots and the age of the tree; the older the tree and the greater the loss of roots the more the top should be pruned. Prepare the soil for planting by plowing deeply and subsoiling whenever practicable. Dig holes large enough to make the roots comfortable. When not practicable to plow prepare larger holes and mix fine well rotted manure with the soil. Set trees out in the spring in preference to the fall, that they may have a good start before winter. Set the trees out at about the same depth at which it grew in the nursery. First fill hole to the required height with well prepared top soil. Place tree in hole with roots in their natural position. Keep tree vertical with a stake. Sift surface soil around the roots. Throw a little soil in at a time, pack this well before throwing in more. The last should be thrown in loosely to act as a mulch.

3. How care for these shade trees?

   During the late summer the man notices that some of his two or three year old trees are dying what could be the cause?

   The ground may be too dry.

   The ground may be damp but the trees may not be getting enough food.

If the ground is too dry:

1. How water these trees? Ref. 11, pp. 107–109.
   1. When water?
   2. How much water shall he give the trees?
   3. How water so that roots will get the water?

IV. How then shall he care for these trees by watering them?

Conclusion: For trees two to four years old give twenty to twenty-five gallons of water every week or ten days. Make around the tree a basin as large as the crown of the tree. The basin should slope from the tree to the outer edge of the basin which should be about eight inches deep. Pour water into this trench slowly. To keep this water about the roots, fill in basin with loose dirt and keep dirt loose.

If trees are not getting enough food:

2. How see that trees get food? Ref. 7, pp. 114–116.
   Ref. 11, pp. 109–110.
   1. What food does the tree need?
   2. In what condition must soil be to make it possible for tree to get food?
   3. How give tree more food?

2. Repeated.

Conclusion: Improve the soil, either by spreading stable manure over the ground in the fall and raking it off in the spring, or by an application of the dressing suggested in reference 7 page 115 or the one suggested in reference 11 page 110. These applications will not only supply food but they will also make the soil porous so that the trees can more easily get the food.

Some of the trees were planted near the street. The trees are now fifteen years old and the lower limbs annoy people who pass along the street.

3. How cut limbs off? Ref. 7, pp. 116–123.
   Ref. 8, pp. 1–12.
   Ref. 9, pp. 169–171.
   Ref. 11, pp. 110–135.
   1. Which shall be cut off?
   2. When prune?

3. How cut off these limbs?
   What tools shall be used?
   Where make the cuts?
   How make the cuts?
4. How treat the wounds?

3. Repeated.

Conclusion: If the tree is less than twenty feet high prune to one-half the height. If larger prune all limbs from ten to twelve feet above the ground. A saw with narrow but strong blade and pruning shears are said to be the best tools. When branch to be cut is more than an inch in diameter make two cuts one about a foot from the trunk and the other one close to the shoulder. Paint wound with coal tar that has been heated to the boiling point for twenty or thirty minutes.

In Oxford very little damage is done by smoke and none from gas, but many trees are severely damaged by overhead wires, regrading, horses, and improper use of guy ropes by contractors. Individual cases are cited and questions 4, 5, 6, and 7, are raised in any order which seems best.

4. How protect from horses? Ref. 7, pp. 129–132.
   Ref. 11, pp. 155–158.

Conclusion: Protect from horses by providing hitching posts, putting up signs, "Do not Hitch Here," passing city ordinances forbidding men to tie animals to the trees, but best of all by providing all street trees with suitable guards.

5. How protect from overhead wires?
   Ref. 7, pp. 125–127.
   Ref. 11, pp. 146–148.

Conclusion: The most effective way to protect from overhead wires is to have ordinances passed requiring all public utilities to lay underground wires. Where this cannot be done it is best not to plant where damage is sure to come from overhead wires. Trees already planted can be protected by denying to companies the privilege of attaching wires to trees and insisting, wherever possible that the devise suggested in reference 11 page 148 be used for passing wires through trees.

6. How see that no damage is done by guy wires?
   Ref. 7, pp. 127.
   Ref. 11, pp. 155.

Conclusion: Wooden strips should be placed between wires or ropes and the tree.

7. How protect when regrading? Ref. 7, pp. 127–128.
Ref. 11, pp. 153–154.

Conclusion: Protect shade trees during regrading by placing wells around them when fills are made, or leaving a mound around them when soil is removed.

Since the hard maple, soft maple, ash, lindens, and the catalpa speciosa have been damaged but little by insects and disease we have not considered the question of their control in connection with this problem. This year we noticed how the parasites were controlling the second generation of the catalpa sphinx which for the first time bothered the catalpas of Oxford.

A stray horse wandered into this man's lot, grazed for a time, and then commenced to gnaw a hard maple. The owner did not notice the tree until it had commenced to decay.

9. What can he do for this decaying maple?
Ref. 7, pp. 139–143.
Ref. 9, pp. 166–183.
Ref. 11, pp. 218–229.

1. How remove the decayed parts?
2. How treat the cavity?
3. How fill the cavity?
    1. With what should the cavity be filled?
    2. How put the cement into the cavity?
    3. How finish the filling?

How treat this decaying tree?

Conclusion: Treat decayed tree by removing all decayed parts, making the opening as narrow as possible. Sterilize cavity with a copper sulphate solution. Water proof by covering with molten coal-tar. Fill with concrete made of one part cement, two parts sand, four parts crushed stone, and enough water to make the mixture settle well into all crevices. Finish with a mixture of one part cement, two parts sand, and water to form a mortar. The filling must stop at a depth equal to the thickness of the bark, the surface of the filling should be convex.

Photo by Verne Morton

"Good little Bossy!"

Humane Education

The Proper Care of a Calf

Pet calves were the special joy of the editor during her childhood; their big wondering, blue eyes, their playful awkward jumping on stiff wide-spread legs, their manner of shaking their tails to express laughter and many other of their calfish ways afforded the keenest pleasure. Many a time have my shoes and dress received an involuntary bath when I was teaching a calf to drink, my arm bared and my fingers placed seductively in its mouth to encourage it to drink the milk in the pail, when a sudden bunt of the head given instinctively to cause a flow of milk in its mother's udder, upset my pail and my patience as well. But the innocent and grieved air the culprit invariable assumed as it tried to get its nose into the spilled milk always condoned the accident.

Housing and Shelter: There are more things necessary to a calf's comfort than some people seem to think, first as to its pen or stall which should be thickly bedded with straw; a top dressing of fresh straw should be added each day and the whole floor should be thoroughly cleaned whenever it becomes damp and filthy. There should be windows to give plenty of light and there should be good ventilation but there should not be a draught as a calf is likely to suffer from the effect of draughts; above all, the floor of the pen should be dry and on a foundation and not simply laid upon the ground as I have too often seen.

For summer shelter there may be a shed provided in one corner of a field of grass or clover; this need not be elaborate but should be upon well drained ground and afford protection from rain and sun.

Food for the Calf: The first food of the calf should be its mother's milk, since this cleanses its digestive tract; if this cannot be fed, an ounce or two of castor oil should be given before it is fed for the first time. If the calf gets its food from its mother it should have three meals a day until three weeks old. If raised by hand, it should be fed on warm (not hot but lukewarm) sweet milk three times a day; this milk should be whole for a few days and then gradually it may be skimmed until completely skimmed milk is given. The feeding periods should be regular; this is of utmost importance.

From six to eight pounds of milk per day should be given during the first week; a pound should be added to this daily ration every week until the food is changed; not more than ten pounds should be given any day. When a month old only skim milk should be given; when two or three weeks old a little grain may be added by throwing a handful into the pail after the milk has been drunk. After it has learned to eat grain it should be given a feed box and when it is six weeks old it ought to be able to eat each day a pound of mixture consisting of three parts corn meal, three parts ground oats, three parts wheat bran, one part linseed meal. Let the calf have a chance to nibble at clover hay and it will soon add this to its ration.

Water should not be given until the calf is two months old and then it should have constant excess to clear cool water.

The Care of the Calf: If strong and healthy, the calf needs fresh air and exercise, so there should be a large yard adjoining its stable in which it can run about. Its manger should be kept

clean, and the pail from which it is fed should be scalded everyday.

It is much easier to teach a calf to eat if it is not allowed to take its food from its mother after the first meal. If it is troubled with looseness of the bowels, less food should be given for a day or two. If troubled with lice, crude petroleum should be rubbed along the backbone, and underneath just where the legs join the body.

To Remove the Horns of the Young Calf: As soon as the young horn can be felt by the hand, it should be removed; the hair should be clipped from around it, then take a stick of potash, carefully wrapped, so that it will not burn the fingers, dip in water and rub it upon the tip of the young horn until the skin begins to loosen and becomes red. Be very careful not to touch the skin surrounding the horn with the potash. This need not be applied but once.

A Note on the Vitality of Seed Corn Six Years old

J. ANDREW DRUSHEL
Harris Teachers College, St. Louis

In the autumn of 1911 the writer selected three ears of Improved Leaming corn from a field grown by B. B. Weaver, Mt. Hope, Ohio. After removing the husk these ears were brought to St. Louis and kept in a drawer under ordinary laboratory conditions at Harris Teachers College. A test in March, 1912, showed germinating qualities better than 90 per cent.

On March 24, 1917, 172 dry grains were planted in a wooden box (inside dimensions 20 in. by 13 in. by 2½ in.) of saw dust which had previously been thoroughly soaked. This box was kept for ten days on the gravel floor of one of the college greenhouses with the temperature ranging from 65 to 70 degrees Fahr.

On April 4th the box was removed to the laboratory, at which time 99 strong plants had appeared. Between April 4th and 12th thirteen more appeared, making a total of 112 strong plants, 65 per cent. of the number of grains planted.

On May 4th these plants were removed and the saw dust was examined revealing sixty grains which either failed to germinate or to produce vigorous plants. In the light of the above it would appear that corn growers might more profitably gather enough seed corn for several years when the season is favorable to the production of corn with good germinating qualities than depend entirely on the corn produced from season to season.

THE NATURE-STUDY REVIEW

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Editorial

WAR AND THE SCHOOL GARDEN

Late in December a seedsman sent a large stock of bulbs left on his hands from the fall sale to one of the schools in Washington—too late for outdoor planting. Feeling that some use should be made of them, classes of children were commandeered to plant them for indoor blooming. While the children planted the teacher talked of the beauty wrapped in the bulbs and the pleasure they were preparing for later days. "But I should like it so much better" said a boy, "if I were working for the soldiers."

War has its effect on every activity. The school garden this season should take on the nature of the war garden. A garden for food production to assist the great army at home is strictly "working for the soldiers." Fewer bulbs were for sale last fall and the number of purchasers greatly reduced. Tulip and hyacinth borders, in consequence will be missed in many school gardens. Beds of annuals will occupy less space. To a degree this is correct teaching, for children should realize that every penny spent unnecessarily is an aid to the enemy; every penny saved is an aid to liberty and that all labor should directly lead toward winning the cause for which we have enlisted. However, with all the vacant lots at schools' disposal it is both extreme and unnecessary to change a lawn into a potato patch or to destroy the perennial garden—the garden of old friends, that has taken so long to become established—in order to raise a few additional cabbages.

The space cultivated by any group of children can be better utilized by the elimination of all paths but the main ones. School gardens laid out in the early days of the movement have the individual plots separated by paths a foot and a half to two feet wide. By omitting these more area for production and a more businesslike garden are secured. The class becomes a closer working unit, more easily controlled.

Experimenting should have little place in a school garden during these times of stress. Crops that are known to be the best local ones; that mature quickly; yield abundantly and are cultivated with ease should be selected. Avoid planting crops that have little food value.

Radishes have always been popular in the past. They bring quick results which children always want, but they occupy much space that could be used for root crops of greater food value. Use them this year but sparingly to mark the rows for beets and carrots and encourage the use of the tops for greens. No waste should be countenanced. The school garden should be a model for the neighboring home gardens not only in thrift and economy of planting but in canning and drying excess products

In the final it all means harder work and greater sacrifice on the teacher's part but it is a form of service that stands on an equal footing with other forms of service the women of the country are so self-sacrificingly engaged in.

SUSAN SIPE ALBURTIS.

TO OUR SUBSCRIBERS

Please note your expiration date and send in your renewals promptly.

Owing to the increased cost of paper and printing, also to the fact that The Nature-Studp Review has not raised its subscription price, we will print only enough magazines eaco month to cover the subscription list and its normal increase.

A blue check on the wrapper indicates that your subscription expires with this number.

A Bird Calendar illustrated in color by the pupils in a Rural School, New Bath, New York

The Teachers' Corner

It is time to be planning for the bird and flower calendars, for these are great incentives to observation of bird and plant life. There are many types of bird calendars and I should like to suggest that this year you try a separate one each for March, April and May. I would suggest as a foundation for the calendar of each month, a piece of card board a foot wide and perhaps 18 inches long. At the top paste on a picture which will represent the month in some manner; for March there should be a snow scene, for April, a landscape with rain descending upon it from some quarter while May should show an orchard in blossom. These pictures may be cut from illustrated magazines, or preferably originals in water-color or colored crayons by the pupils in the school. There might be a competition in the drawing class, the best ones to be selected for the calendars. Below the picture should be two or three sheets of lined quarto paper; each sheet should be divided into four columns, the first for the name of the bird, the second which should be a narrow column contains the date; the third tells where seen and the fourth by whom. If the same bird is seen by two or three pupils on the same day a "ditto" may be placed below the name of the bird and the date made by the first one who made the record.

However many birds may have been seen in March, they should be recorded again in the April and May calendars if they are seen during those months; this will stimulate the children to keep on the alert and it gives them practice in recognizing species.

If no appropriate picture can be found for the heading of the calendars a picture of a bird may be used or the stanza of poetry which will represent the month.

We have seen some very interesting calendars on larger sheets of cardboard, the record in the middle and a border of bird pictures made by the children. These were colored with crayon or water color and were probably copied from some bird books. Outlines of birds might be colored and then cut out and pasted on the sides of the calendar.

The flower calendars should cover the months of April and May; they may be ornamented with pictures of flowers drawn from nature by the pupils.

The original of the bird calendar shown on the opposite page contained several sheets of card board—illustrated in color—and was made by the pupils of Miss Jennie Schofield's School near Bath, N. Y. Miss Schofield's pupils have won the first prize for bird calendars for two years at the Cornell Farmer's Week Exhibit of Rural School Work.

News Notes

CALIFORNIA

The following letter fully illustrates the power of an idea when accompanied by the service of an enthusiast. If Mr. Goethe keeps on, California will not possess an unread roadside or nature book. Why cannot other states have a Nature-Study League opening up nature's secrets to all the people by means of the newspapers?

SACRAMENTO, Cal., 1–5–16.

To the Members of the California Nature-Study League:

Someone has said that none of us know how far our influence may extend. We have an example of this in the work of our "Nature-Study League." Some of our members spent the summer vacation in Glacier National Park. One of them was interested in the alpine flora. He had difficulty in obtaining literature, although otherwise practically every arrangement had been made for the convenience of visitors. This League member wrote President Hill of the Great Northern Railway Company, which controls the Glacier Park Hotels. He told President Hill o the work of our League to awaken a wider interest in Nature-Study books. He asked if small nature-study libraries might not be provided at each of their hotels and chalets, also at their tepee camps, offering to make a contribution toward the fund if the Railroad Company would undertake the work.

The following is quoted from President Hill's reply: "We will adopt your suggestion and see that the camps are supplied with suitable works on the Montana Rockies." This happened because of the work of our League. It shows how our influence may extend into unexpected quarters. Is not the idea of small summer nature-study libraries worth further thought? Possibly we may see the time when every summer resort in California will have its Nature-Study Library at the very spots where such rich material is at hand.

Another news item: The use of our bulletins in the Sacramento City Schools, at the suggestion of Superintendent of Schools Hughes, has pointed the way to another opportunity. Letters are being sent to each California County Superintendent of Schools offering the League's services gratis to the schools of each county whose Superintendent is willing to make his office the center of distribution to such schools. Already fifteen acceptances have been received. The stories will therefore be henceforth used in hundreds of schools.

A third news item: Last month Mrs. Goethe and I took our regular quarterly tramping trip. The way crossed several mountain countries. We found the stories from *The Bee* printed in the rural papers. This month we are sending an invitation to 51 additional newspapers offering them the League's Nature-Study service free if they will print the stories leading up to calls for Nature-Study books at the County libraries. Trusting that the close of 1918 will show further successes,

Very earnestly,

C. M. GOETHE.

Y. Z. 9

RHODE ISLAND

Providence—The teachers of the state recently received the following invitation from Professor Vinal of the Normal School:

TO THE PUBLIC SCHOOL TEACHERS OF RHODE ISLAND

You are asked to render a distinctly patriotic service by co-operation in the solving of the country's food problem. Doubtless you already have brought into your teaching, incidental to language lessons or as a part of general sciences, the facts of food conservation. You are now asked to pass

on your suggestions to your fellow teachers. To facilitate this exchange of ideas the R. I. Science Teachers' Association has arranged for an exhibit to be held at the Normal School, Saturday, January 12, 1918, 10:00 a.m. to 1 p.m., lectures beginning at 11:20. Teachers, principals, and superintendents should feel a professional responsibility for contributing their share in a service that is so absolutely essential to the nation. Get an idea, place it on a placard so that others will get it and send the exhibit to the committee at the Normal School.

The following speakers will give practical talks and demonstrations as to what teachers can do in food lessons: (The first lecture will begin at 11:20 a.m. Professor P. H. Mitchell, Brown University; Mrs. Ida S. Harrington, Home Economics Director for Rhode Island, and others.

The exhibit resulting from the hearty response by the teachers must have been gratifying, to say nothing of showing patriotism. There were many suggestions for teaching topics relating to the present food crisis. There were charts showing food conditions at the time of the Civil War and at other national crises; food lessons in geography; suggestions for drawing food posters; an exhibit showing that we must save for the soldiers with substitute foods and correct combinations; Hoover lunches for the lunch box, prepared by pupils; an exhibit of colored slides showing the foods of Narragansett Bay that should be eaten and are not; foods that were eaten by the Indians and the colonists but are now neglected. There were practical talks on simple food experiments with lessons on foods. There were dialogues appropriate for grade pupils written especially for the occasion—all relating to foods.

It must have been a most valuable exhibit and program, full of timely suggestions. The teachers of Rhode Island are certainly very much alive.

The *Rhode Island Horticultural Society* has had during the present season addresses on "Gardening for Women" by Miss Mary E. Cutter; on the "Providence County Farm Bureau and its Work," by Mr. David Elder; and on "Small Fruits and Berries," by Mr. Wilfred Wheeler, secretary of the Massachusetts Board of Agriculture.

The *Providence Franklin Society* is nearly 100 years old, being incorporated in 1823 for the purpose of interesting people in physical and natural sciences. It meets everymonth in Rhode Island Hall, Brown University. All interested are invited to attend and to bring specimens. On January 23d the subject was, "Fossils Flora of Rhode Island" by Miss Marion Weston, and on Feb. 6th, "Recent Flora of Rhode Island," by Miss Eda Round.

The following announcement makes you know that Rhode Island is one of earth's pleasant spots and that you would like to belong to this club:

RHODE ISLAND FIELD NATURALISTS CLUB

On Saturday evening, January 26th, 1918, at eight o'clock, the usual January Meeting of the Club will be held in the Lecture Room of the Providence Public Library. Short business meeting.

Instead of a formal lecture as in past years, we are to have a number of short talks by some of our members, as follows: "Experiences of a Naturalist," William G. Vinal; "Bird Banding," Harry S. Hathaway; "Hunting Tigers in Rhode Island Jungles," Dr. E. E. Calder; "Jogging the Memory" (illustrated), Prof. J. Franklin Collins.

You will see this is to be an extraordinary meeting. You will miss a treat if you are not there. WILLIS E. CHANDLER, *President.*
MARTIN BOWE, *Secretary.*

Special Request: Will you kindly bring to this meeting a written suggestion for one trip to be taken next season?

Miss Schofield's School

NEW YORK

Bath. In the rural school at Unionville, three miles from Bath, some genuine nature-study is being done under the direction of Miss Jennie Schofield. The twenty-one boys and girls are doing things.

They have learned to recognize trees by their leaves so that on a recent trip some of them could write down the names of as many as 29 out of 32 as fast as their teacher pointed them out. No one above the first grade knew less than 12. They have made leaf collections for themselves and for the school, and are now learning identification of leafless trees, besides making a thorough study of the Norway Pine.

In their school herbarium they have over 60 wild flowers and weeds which they have collected during the noon hours, and pressed and labelled. Their collection of weed and other seeds they have placed in small bottles to be mounted and labelled with name, name of pupil, and grade.

The boys have built a terrarium in which they watched caterpillars spinning their cocoons, or burying themselves in the ground.

Their aquarium has contained all the fall, a tadpole which had developed its hind legs, and two black-nosed dace, caught in his hands by a little boy at a nearby brook. The dace and the tadpole had lived happily together for more than five weeks, the fish nearly doubling in size on a diet of fish food. A recent cold snap in the weather cracked the glass of the aquarium, so the boys decided to release the inhabitants.

Around the Year in the Garden. Frederick Frye Rockwell. The Macmillan Company. 350 pages. Illustrated. $1.75.

The author says in his foreword that this book is designed for the busy man or woman whose spare time available for gardening is limited, and who, consequently, is interested in utilizing every hour to the best purpose.

The book begins in an engaging manner by getting people to thinking about their gardens in January. Nothing is so fascinating to the gardener as planning the spring and summer work. This and getting tools ready and ordering seeds, occupy January. February brings a definite plan of this year's gardens, —vegetable and flower, and starting seeds in the greenhouse and planning fertilizer for the soil. Mr. Rockwell's plan for March must be for a more Southern climate than ours but might be used for April,—for he begins planting out of doors in this month. However, he plans definite work for each week —including planting, cultivating, weeding, spraying for insect and fungus pests mulching for the dry weather, summer pruning, and tells which week of which month we are liable to have to look after a special crop. There are specific directions for planting and care of all the plants grown in the flower and vegetable gardens. Directions are given for building a hot bed and cold frame, and various ways suggested in which concrete may be used to help in gardening. Methods of tree doctoring are described,—also the making of winter window gardens. *Around the Year in the Garden* is certainly a most complete and helpful manual.

The Strawberry in North America. S. W. Fletcher, Professor of Horticulture at The Pennsylvania State College. 227 pp. with 26 illustrations. Published by the Macmillan Co. $1.50.

This book completes a survey of the strawberry as grown in North America, dealing mainly with the origin and history of the North American type Modern cultural methods are presented in a companion volume, "Strawberry Growing." The book is divided into six chapters; the first taking up the early history of the fruit beginning with strawberries in the colonial days; the wild strawberries of Virginia, New England and the West and gives the first steps in the domestication of the wild strawberry. It then goes on to the beginning of garden culture and the beginning of commercial culture near Boston and New York speaking of the yield and the prices at that time. Then the introduction of the Hovey strawberry, its origin, first novelty and its unsatisfactory results. The extention of the commercial culture from 1838–1854.

The next chapter takes up the rise of commercial strawberry growing beginning with the introduction of the Wilson, its origin, immediate popularity good points and objectionable features; also its competitors, the Crescent and Sharpless. Contrasting methods of culture; field culture at Cincinnati, market garden at Pittsburgh and the special cultural methods such as hotbeds and strawberry mounds. The improvement in transportation facilities: extention of railroads, ventilator cars and introduction of the refrigerator cars. One section of this chapter is given up to the early history of some of the older strawberry districts, such as New Jersey, Delaware, Maryland, and another chapter gives a specially interesting history of the experiences in pollination of the blossom. Then follows a chapter very interesting and complete upon the origin and botany of the strawberry, another on the Desirable Characters in a Variety, and a last and most important one on breeding. Professor Fletcher has given us in this volume an interesting straightforward and comprehensive account of the history and cultivation of this favorite fruit.

A Textbook on Botany for Colleges. Part II. By William F. Ganong, Professor of Botany in Smith College. Published by The Macmillan Company.

While Part I of the author's text deals with "The Structures and Functions of Plants," Part II is devoted to "The Kinds and Relationships of Plants." Plants are here considered (1) in the light of their evolutionary kinships and (2) in relation to their ecological habits. Somewhat less than half of the book is necessarily concerned with Algae and Fungi as in these groups are found much evidence as to the origin of the higher forms. Those groups of Fungi which produce diseases of plants are briefly but clearly discussed and fully illustrated as their economic importance demands.

In considering the Spermatophyta, both Monocotyledons and Dicotyledons are treated under three series,—A. Primitive; B. Differentiated; C. Specialized, as well as according to their taxonomy. The last chapter treats of the Ecological classification of plants.

As one might expect, Professor Ganong's text is delightful for its clearness, its conciseness and scholarly simplicity, resulting from his long experience and well known interest in the teaching side of botanical science.

M. E. H.

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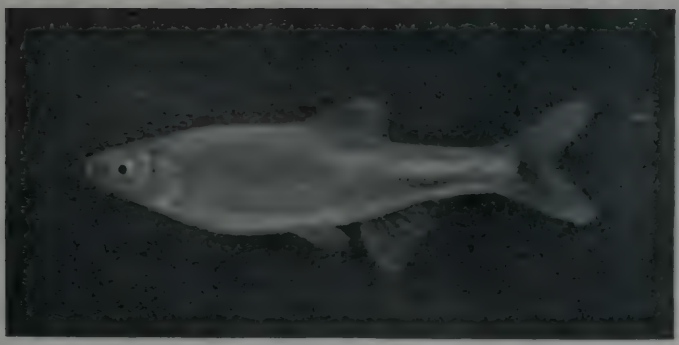

A Silver Fin Shiner

Photo from living specimen by G. C. Embody

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THE
NATURE-STUDY REVIEW

VOL. 14 APRIL, 1918 NO. 4

A Fish Pond for the Farm Boy

JAMES G. NEEDHAM

Here is a home enterprise that I can commend to any one who has a place for it, and that I especially commend to the farm boy. It is a home fish-pond, to be made, like the home garden, a permanent part of the farm equipment—a place to raise things, a source of choice products for the table, and a place for pleasant recreation. Especially at the present time do I commend the home fish-pond; for the boy who will establish and carefully manage one may accomplish all these good ends:

1. He may add to the food supply. Probably there is no equal area of the farm that will yield so much good food as will the portion included in a good fish-pond, or that, when once established, will yield it with so little labor.

2. He may make money; for the products of the fish-pond, fresh from the water, are more than ordinarily salable.

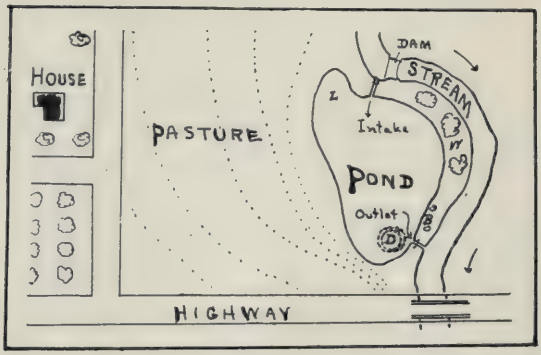
3. He may add to the beauty and to the market value of his home place; for there is nothing in nature more beautiful than a clean pond with attractive shore lines, its mirroring surface reflecting tree and cloud and sky. Then, too, a pond may best be put where it will eliminate a swale or boggy place that has been both an eyesore and a breeding place for mosquitoes.

4. He may find new means of recreation; for a fish-pond, besides being a good place in which to fish, may be made a good place in which to swim in summer, or on which to skate in winter.

5. He may become a leader and a pioneer in a new enterprise, that is now in its infancy, and that is destined to be widespread in the future.

Not everybody can have a fish-pond, because more water is necessary than some farms have to spare; but many farms have permanent streams with good water running away all the time.

In the low swale by the streamside—not in the bed of the stream—is the place to make the pond, and preferably near the house for convenience in giving it the necessary attention. Considerable labor is required for the making of a pond, but fortunately this work needs to be done but once. Fortunately, also, in these days of labor shortage, the best time for doing it is the dry season following harvest, the slack time on the farm. A few days work with men and teams using plow and scraper will do it. Of course, the boy will have to be helped with this heavy work; but any farmer should be willing to give his boy this start. The home fish-pond is managed like the home poultry-yard; hence, it must be so built as to be always under control. An outlet from the bottom of it must be provided, so that it may be entirely drained when necessary; and the intake from the stream must be so constructed that the pond will not receive the silt and floating trash from floods. The accompanying plan suggests a suitable arrangement.



A Farm Fish-pond. Dotted lines indicate contours of the slope going down from the house. *D* is a cup-shaped elevation of the pond bottom for retaining a little water into which live fish may be dipped when draining off the pond. *B* is a clump of birch trees, planted here for the sake of their reflection. *W* is willows on the embankment furnishing a little shade. *L* is a bed of water lilies.

If I were giving a boy specific instructions for making a pond, I would say that the necessary order of procedure is the following:

1. First, construct the pond basin. Scrape out on the side next the stream sufficient earth to make overflow of flood waters impossible, else silt will fill the basin up again. Scrape the rich black muck out over the edges to level up the bordering lowlands making of them all dry and productive soil. Deepen the center well below danger of freezing. Leave the banks gently sloping. If the bottom is too soft to drive a team across, hitch a cable to the scraper and use a few pulleys. A gasoline engine and a hoist with

quick return, such as is used for filling the barn with hay, will make shorter work of the excavating.

2. Then construct inlet and outlet, as already suggested. Specific directions and plans may be found in Dr. G. C. Embody's bulletin on *The Farm Fish-Pond*, a copy of which may be had on application to the New York State College of Agriculture at Ithaca.

The ruffled pond-weed: one of the most useful and ornamental of submerged water plants.

3. Then let the water enter through proper screens, so as to have no fishes in the pond except such as you want to raise.

4. Then plant the pond with suitable aquatic vegetation, and do not introduce the fish until you have provided something for them to eat. Like chickens, fishes require food. The common pond weeds, such as grow in any submerged meadow in shoals of lakes and natural ponds, are most valuable. You may easily get plants for stocking by hauling them out of such shoals on a loop of barbed wire drawn slowly through the water. Plant the sprays of pond weed singly all over the pond bottom. This may be quickly done by pressing a handful of stiff clay about the base of each stem before throwing it into the water; it will then sink to the bottom and take root there. In a few weeks the pond weeds will be found to shelter an extensive population of small crustaceans and insects suitable for food of fishes.

Plant also a few of our beautiful native flowering plants, such as water lilies, pikerel-weeds, and forget-me-nots, at the edge for ornament. Plant willows on the bank to hold it against future washing of the stream, and to give partial shade.

5. Finally, when everything is ready, put in the fishes. Use small fishes of nearly uniform size. National and state fish commissions stand ready to supply these on application, and to give advice as to the kinds best adapted to different localities.

6. Go out and catch your fish, first giving them time to grow to table size, keeping, the while, an eye on the pond to see that everything is working properly. The water should be always clear and sparkling by reason of the oxygen continually liberated from the pond weeds. The water meadows should grow dense and full of forage. If pond-scums grow extensively, add a few alga-eating fish, like goldfishes or golden shiners, to keep them down. Once properly set agoing there is little to do with such a pond as this except to catch your fish; and the methods you use in catching them will vary much according as you do it for business or for sport.

DR. SHUFELDT, A TRUE PATRIOT

At his own request, Dr. R. W. Shufeldt has been returned to the active list of the Medical Corps of the Regular Army, and has been detailed to the Army Medical Museum, in Washington. Although Dr. Shufeldt is deeply interested in his research work, he feels that now is the time when his country needs the aid of every man and so he has cheerfully given his services.

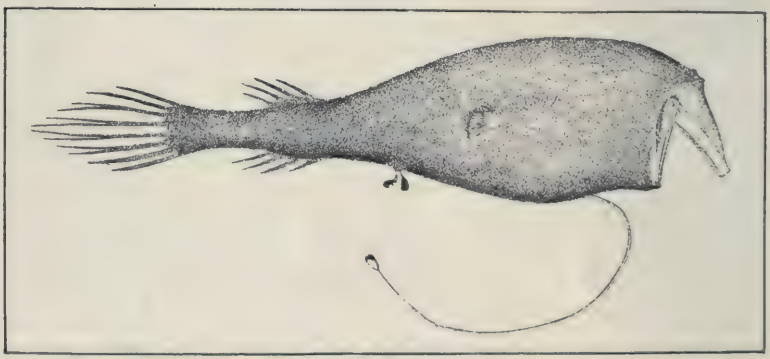


Fig. 21. The Blind Angler. See page 140.

The Physiognomy of Fishes

R. W. Shufeldt, M.D.

A part of a paper read before the Aquarium Society of Washington, D. C.

When we employ the terms physiognomy in its restricted sense, it is taken simply to mean the art of character-reading in man through a study of what his facial features indicate. It is further defined as the art of ascertaining the general characteristic qualities, mental as well as temperamental, of a person through similar observations. Some of the researchers in this field still further extend the domain of physiognomy, including in it character-reading in mankind through a study of not only facial indications, but of the entire body as well, both in health and disease; when at rest or in motion, and when life is extinct. It also refers to fortune-telling from the face, and finally to the configuration of any object, even including a landscape. These last two definitions do not concern us here; and the way the term is usually defined in our best lexicons fails to come up to what the legitimate scope of physiognomy really is.

In the first place, if what it represents to us, either in face or form, is correctly interpreted, and the ascertained facts systematically recorded, it ceases to be mere art, and unquestionably passes into the realm of the anatomical and physiological sciences. More than this, it should, in its application, be taken to include not only the representatives of our own species, but of all other animals, as far down the scale as to include those that exhibit any characters or movements of the face and body, which indicate to the mind of the observer, their meaning in the individual exhibiting them. Meanness of character; viciousness of temper, cowardice, hate, sympathy, and numerous other characteristics and emotions, are as distinctly indicated, when well pronounced in the face of an ape, or a dog, as in most men and women. This being the case, animal physiognomy should be defined as the science of determining some of the characteristics and temperaments of individuals, through a study and comparison of what the face and form presents at all times during health and disease, and after life has become extinct. Phrenology is but a department of physiognomy, and both have not a little in common with comparative psychology.

With this in mind, and confining ourselves to the consideration of the facial features and what they may indicate, it may be pointed out that there are two principal views that can be taken of a face—the view *en face* and the view *en profile*.

Passing for the moment to the great fish group or *Pisces*, we find that representatives of every group in the system, up to include mammals, all possess a facial part of the head, which is very different when viewed *en face* from *en profile*. In all the groups below mammals, however, there is little or no variation in the facial expression, beyond what the eyes often expresses associated with what the mouth is capable of expressing. This is due to the fact that there is, in all these forms, an almost complete absence of anything approaching muscular play and flexibility of such facial muscles as may be present in these types.

In considering fishes, it is proposed here to ignore their physiognomy as viewed *en face*, although being, in nearly all instances, most important and interesting, and confine our observations to the marvelous variations that are to be seen when we come to compare the 12,000 or 13,000 fishes of the world now known to science, *en profile*.

A very large number, if not the majority of fishes of the world's ichthyfauna, present, upon the side view of the head, an outline, with its included features, that may be referred to a common type. Average examples of this may be seen in our common black bass, in the perch, and in the various species of sunfishes of the American rivers and streams. It is, to all intents, triangular in shape; the base of the triangle being represented by the line joining the first vertebra of the spine and the point immediately below it in the ventral region, the mouth being in the anterior angle. Sometimes the head is very deep, in which case this angle is very obtuse; while in other species the head is more or less narrow from above, downwards, and as a consequence this anterior angle becomes, to a greater or less degree, acute. Further, in the generalized head to which reference is made, the eye is of moderate size, the gape rarely being carried posterior to that organ. All the bones found in the side of the head are here, too, of the simplest form, and as they occur in the group generally. No unusual spines or other appendages are to be met with projecting from any of these bones,—indeed, all the other structures and characters are similarly presented in their greatest simplicity,

as we find them in typical fish forms in the waters of the globe everywhere.

When we come to study the heads of other fishes, however, with this simple one in hand, it is truly astonishing to observe the amount of variation that has taken place throughout all the families known to us. There is no structure of this part of the ichthyic economy which has not been powerfully altered in some way or another. Cephalic organs have either been greatly exaggerated, or else entirely suppressed. The skull as a whole in not a few species has become so thoroughly distorted and twisted that, in a few instances, it almost ceases to resemble the head of a fish. Others have remarkable appendages attached to the head, and these are of a great variety of kinds and forms. One group at least, with numbers of its allies near and remote, have the skull turned completely sidewise, with both eyes rotated to one side. Flounders and their congeners well represent these.

Passing now to a consideration of the profile of the head in various groups of fishes, it may be noted that, in some instances, this configuration has been likened to the fancied resemblance to other animal forms, or even to inanimate objects. As an example of the former, the Sea Horse (*Hippocampus hudsonius*) may be cited (Fig. 20), the anterior third of its body bearing a certain resemblance in outline to a maneless horse in miniature; while upon the other hand *Selene vomer* (Fig. 14) has also been called in the vernacular "horse-head," the "moon-fish," and also the "look-down"; there are no end of instances of this kind.

In many fishes the elongation of either the upper or the lower jaw is, in the adult, a permanent feature of the face, and in not a few instances it has its uses. Such a modification is well exemplified in such forms as the Common Paddle-fish (*Polyodon spatula*); in the well-known saw-fish (Fig. 2), and in many others; while in such a species as any one of the Halfbeaks, as *Hyporhynchus unifasciatus* (Fig. 11) it is only the lower jaw which is unduly prolonged. Occasionally the entire face is thus produced, and a small mouth is present at its distal extremity, as we see it in several species of the so-called Trumpeters, the Spotted Tube-mouth being an interesting example (Fig. 12).

Appendages of various kinds, some of them having their actual uses, appear on the heads of no end of various species of fishes. These appendicular structures naturally add to the character of the profile of the form possessing them.

In the Sucking-fish or Remora the dorsal fin has been curiously modified into an elliptical sucking-plate on top of the head and fore part of the body. It lends to the head of this fish a very peculiar profile, well seen in either *Echeneis naucrates* or the *Remora brachyptera* of a related genus. Often these head appendages are very simple, as we find them in the Catfishes; or they may be more numerous and elaborate, such as they occur in the grotesque-appearing Sea Ravens of the Atlantic Coast of America (*Hemitriplerus americanus*, Fig. 17).

Examples of where these appendages may be of actual use are to be observed in a large number of those most extraordinary of all fishes, the small, deep-sea ones, which often live one or two miles below the surface of the ocean. Thousands of forms occupy that region of which we have as yet no knowledge whatever.

The late distinguished naturalist of Norway, Prof. Robert Collett, described one of the most marvelous of these deep-sea fishes, and my own illustration of it may be found in the Century Dictionary. It has been named *Linophryne lucifer*, and was collected off Maderia in 1907. One of its popular names is the Torch-fish, for the reason that it bears upon its snout a little electric torch, while back of its chin there is to be found a flexible, whip-like little appendage, with a feathery, free end to it. This by the aid of the aforesaid light, is used to attract small fishes, and when these unwittingly swim about the entrance of the great mouth and jaws of this species, he darts forward and seizes as many as he can of them for his meal.

Another good example of this is the so-called "Blind Angler" (*Mancalius shufeldti*), originally described by the late Dr. Theo. N. Gill, and named generically *Typhlosaras shufeldti*, he supposing that the fish possessed no eyes. These organs were subsequently discovered, however, by Mr. Todd, who figured the only specimen of this fish at present known (Fig. 21).

Many Sharks and not a few of their allies possess very remarkable physiognomies. In them the snout is produced forwards, and the mouth is upon the under side, often far back as in the Cat Shark, a deep-sea species known to science as *Scylliorhinus profundorum* (Fig. 1).

Chimera affinis (Fig. 3), a species three feet long and related to *C. monstrosa*, occurs in the deep waters of the Atlantic Ocean. Its head on profile might remind one of any of the fabulous beings

FIG. 1. The Cat Shark (*Scylliorhinus profundorum*). FIG. 2. Saw Fish (two views of its beak) (*Pristis pectinatus*); greatly reduced as in the cases of all the other figures. FIG. 3. Elephant Fish (*Chimera affinis*). FIG. 4. Snipe Eel (*Labichtys carinatus*). FIG. 5. One of the "Gulpers" (*Saccopharynx ampulla*). FIG. 6. *Gastrostomus bairdii*, a still more extraordinary form of gulper. FIG. 7. *Aleposomus copei*. FIG. 8. Profile of *Argyropelecus olferi*, the Silvery hatchet. FIG. 9. Four-eyed Fish (*Anableps dovii*). FIG. 10. Blind fish from the Mammoth Cave of Kentucky (*Amblyopsis spelæus*). FIG. 11. One of the Halfbeaks (*Hyporhamphus unifasciatus*). FIG. 12. A Trumpeter (*Aulostomus maculatus*), Florida. FIG. 13. The Marian (*Holocentrus murinus*). FIG. 14. The Look-down or Moon fish (*Selene vomer*). FIG. 15. *Grammicolepis brachiusculus* of Poey. FIG. 16. The Porcupine fish (*Diodon hystrix*). FIG. 17. A Sea Raven (*Hemitriplerus americanus*). FIG. 18. One of the Stargazers (*Kathetostoma albigutta*). FIG. 19. Head of a Flounder seen from above.

of the monster order of fairy-land. They are called Elephant fishes, but for what reason it is not said. Doctor Jordan described the common *Chimæra*, stating that the name was derived from a Greek word meaning "fabulous monster, with the head of a lion, body of a goat, and tail of a serpent." It has a very rotund face, the very opposite of which is seen in Fig. 4, one of the Snipe Eels (*Labichthys carinatus*) of the Gulf Stream, a fish with its jaws drawn out to almost needle-like proportions; it has allies with equally strange-looking profiles.

Gulpers of the Atlantic deep-sea fauna almost seem to have surrendered their title to being fishes at all, and surely the profile of any one of them is a long ways from the typical ichthyic contour.

Saccopharynx ampulla is one species of these, and it will swallow a fish very much larger than itself. Four species are known, the one just named being six feet long, its tail being four times the length of its body (Figs. 5 and 22). With even a more capacious mouth, and an almost microscopic eye, the *Gastrotonnus bairdii* is to be reckoned among the most remarkable of existing deep-sea fishes. It was taken off the Newfoundland Banks, in 1467 fathoms of water, and it measures in length some eighteen and a half inches, of which only six and a half inches can be claimed by the body (Fig. 6). On the other hand, we meet with deep-sea species with unusually small mouths, and many years ago I described the osteology of one of these. We still have but one specimen of it, which was purchased in the Havana markets in

FIG. 22. The Gulper (*Saccopharynx nmpulla*).

1872 by Prof. Philipi Poey, who named it *Grammicolepis brachiusculus* (Fig. 15), impressed as he was by its short pectoral fins and linear scales. As in other deep-sea species, it possessed very large eyes, but not as large as we find them in such forms as *Aleposomus copei* (Fig. 7), of which a specimen three and one-half inches in length was taken in 2099 fathoms of water, or in *Holocentrus marianus* (Fig. 13), a very spiny deep-sea species, with as many bones in its skeleton as a shad. Indeed, its specific names is from a negro word, marian, meaning "tough and bony."

Another deep-sea species with a grotesque profile is the "Silver-hatchet" (*Argyropelecus olfersi*, Fig. 8). This fish goes down to the greatest depths in the daytime, and only comes to the surface at night. It belongs in the open Atlantic fauna, and has been taken off the coast of Norway, Brazil, and South Africa.

The matter of eyes as pertaining to the profile or lateral physiognomy of fishes is very interesting. They often become

very large in order to gain the light to see, as in examples already described; but where the light is permanently withdrawn the species in time loses its eyes entirely, instances of which are to be observed in the famous blind fishes of the Mammoth Cave of Kentucky and elsewhere in the United States. *Amblyopsis spelæus*, a colorless species, is the name of the latter form, and, being very tenacious of life, they make most interesting species to study in aquaria.

When we come to look into the matter of eyes, however, and the part they play in the physiognomy of many fish, there is no stranger form in all the world presenting itself for our consideration than the American "Four-eyed fish" (*Anableps dovii*, Fig. 9). This species occurs at Panama in the Canal Zone. In it the integuments of the eye are divided into upper and lower portions by a dark-colored, transverse band of the conjuntiva, while at the same time the pupil is incompletely divided into two by a pair of lobes projecting from each side of the iris. This gives the fish *two pupils* in either eye, in either orbit. One of these gazes upwards and the other lateral-wise, the first employed for water use, and the other for objects in the air; it is a surface species that subsists upon insect food.

Related to the Puffers we have the Porcupine fish (*Diodonhystrix*, Fig. 16), and a most remarkable profile it possesses. It has a bony coat-of-mail, from which projects scores of needle-pointed spines of many sizes, while in its mouth it has but two teeth surrounded by fleshy lips. These fish grow to be three feet in length, and their bellies are moderately inflatable as in their allies, the Puffers and Swell-fish. My collection contains a fine skeleton of one taken in Bermuda by the collectors of the New York Aquarium.

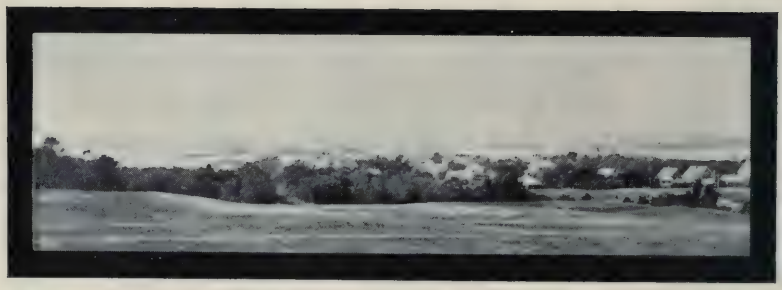
Vertically slit mouths are by no means confined to the deep-sea species, for our surface Stargazers (*Kathetostoma albigutta*) present the same arrangement, and their profiles are rendered correspondingly remarkable (Fig. 18). These species have a way of settling down in the mud or sand of the bottom until the mouth is flush with the latter. Here they lie in wait for the small fishes which form their food.

FIG. 20 One of the Sea Horses (*Hippocampus hudsonius*)
See page 139.

WHAT DR. JORDAN SAID ABOUT A SEA HORSE

"He was a little bit of a sea horse, and his name was Hippocampus. He was not more than an inch long, and he had a red stripe on the fin on his back, and his head was made of bone, and it had a shape just like a horse's head, but he ran out to a point at his tail, and his head and his tail were all covered with bone. He lived in the Grand Lagoon at Pensacola in Florida, where the water is shallow and warm and there are lots of seaweeds. So he wound his tail around a stem of a sea-wrack and hung with his head down, waiting to see what would happen next, and then he saw another little sea horse hanging on another seaweed. And the other sea horse put out a lot of little eggs, and the little eggs all lay on the bottom of the sea at the foot of the seaweed. So Hippocampus crawled down from the seaweed where he was and gathered up all those little eggs, and down on the underside of his tail where the skin is soft, he made a long slit for a pocket, then he stuffed all the eggs into this pocket, and fastened it together, and stuck it with some slime. So he had all the other sea horse's eggs in his own pocket.

Then he went up on the sea-wrack again, and twisted his tail around it, and hung there with his head down, to see what would happen next. The sun shone down on him, and by and by the little eggs began to hatch out, and each one of the little eggs was a little sea pony, shaped just like a sea horse. And when he hung there with his head down he could feel all the little sea ponies squirming inside his pocket, and by and by they squirmed so much that they pushed the pocket open, and then every one crawled out and got away from him, and he couldn't get them back, and so he went along with them and watched them to see that nothing should hurt them. And by and by they hung themselves all up on the seaweeds, and they are hanging there yet. And so he crawled back to his own piece of sea-wrack, and twisted his tail around it again, and waited to see what would happen next. And what happened next was just the same thing over again."—DAVID STARR JORDAN in *Fish Stories* published by Henry Holt, a very interesting book for the school library.



A View Across the Hole Showing the Weepeckets in the Distance. Wood Holes in the Foreground.

The Weepeckets

Elizabeth Dorothy Wuist, Ph.D.

Altho of no economic importance, the chain of three small islands off Cape Cod about one-fourth of a mile from Nauschon, one of the Elizabeth Islands, is of interest to bird lovers as the summer home of hundreds of Terns. These little islands are locally known as Weepecket, Wee Weepecket and Wee Wee Weepecket. They vary in size from the largest Weepecket containing ten to twelve acres to the least Weepecket with its quarter of an acre of storm-swept sand and rocks.

To visit these islands it is best to take motor or row boat from Woods Hole, Mass., and the most interesting time to do this is in the early part of July for it is then that the little birds may be seen. The only place on the journey which may offer any difficulty to the motor or row boat is the narrows between Devil's Claw and Red Ledge when a strong head tide is running between six and seven knots an hour, as may be judged by the barrel buoy which tugs at its moorings and rolls up the current before it. This point passed safely and the minor waterway locally known as the "Gut" or "Gutter of Cancer" crossed diagonally, the wider expanse of the Hole is reached. Where the Hole widens into Buzzards Bay, the old bell buoy stands guard and as it rocks to and fro it rings out its warning with a doleful dong-dong. As there is no current out in the Bay no further difficulties may be anticipated.

Gulls and Terns circle over head, now high, now low, or head in a direct line for the Weepeckets, as if homeward bound from a successful fishing trip; others pass on their way back to the harbor to catch the small fry that frequent the quiet waters. Suddenly a

bird will drop, plunging into the waters after an unlucky fish. As the bird rises, its fellows are quick to note its success or failure; if a fish is held firmly in its bill they immediately give chase and each attempts to snatch the fish. If it is dropped, in the bird's attempt to escape from the pursuers, they give up the chase with cries of seeming mockery.

Tall dark stakes with ropes stretched between them, silhouted against the sky mark the fish traps. The tops of these posts offer resting places where perch Gulls and Terns who seem to have become wise as to the best fishing grounds and select these as places of vantage from which to dive.

When the gravelly beach on the north side of Weepecket, the largest of the three islands, is approached there is a whir of white wings, accompanied by a din of shrill grating sounds, which seem to carry warnings and threats, as the Terns, disturbed by the noise of landing, rise into the air from the beach and nearby grass. The birds do not fly away but continue to circle over head, while keeping up their incessant irritating noise.

The boat anchored, one can wend his way along the sandy beach just above tide water, always at the vortex of a whirling mass of Terns which swoop down and utter their cries in close proximity to one's head. By degrees the ears become accustomed to the sound and the necessity of watching one's steps as well as the sight before one causes the attention to be centered on the ground. Eggs are everywhere; a broad and general estimate would indicate thousands of nests containing from two to three eggs each. On the sand, it is evident that the birds have made no attempt to construct a nest as the eggs are in groups of twos and threes lying among the stones. On the drift which consists of sticks, weeds, dried eelgrass and sea weed very crude nests have been made by hollowing out a slight depression in the drift. The nests are scattered all over the drift in a very precarious manner as it would seem to one accustomed to seeing this part of the island later in the season, when one good wave would sweep them away. However, this is the shore least exposed to storms during the summer season. The irregular placing of the nests with hardly a foot's space between them requires care to avoid stepping on the eggs. When the eggs are laid on the sand among the stones it is hard to distinguish them from the stones. As one proceeds in and out among the nests, the birds' cries become shriller. Thinking that the beach may be the

A bird with a broken wing.
A nest among the shrubs.

Hiding.
A nest on the drift.
A young tern.

favorite nesting place one turns his steps to the inner part of the island which is covered with scattered bunches of low, coarse beach grass. One soon finds that the beach is not the only inhabitated portion of the island, in fact it seems doubtful if it is the preferred location, but rather selected as the result of congested conditions or inexperience on the part of younger birds. Here one finds the small birds, apparently all of about the same age "still wearing a ruff of down." They closely resemble little chickens and their color blends from gray and olive-brown above to white below with black spots scattered irregularly over the head, back and wings. When the nests are approached they scurry away in different directions and hide in the first place which seems to them to offer protection. Often they thrust their little heads under a single spear of grass and, confident that they are hidden, remain quiet until actually touched. While the little birds are being hunted, the frantic, screaming parent birds hover, dart and whirl almost striking one with their wings.

Continuing across the island the ground rises gradually to an elevation of twelve to fifteen feet, then slopes abruptly, on the south, to a rocky coast. Altho this is the highest part of the island, relatively fewer nests are observed as shrubs and bushes are lacking and the coarse grass with an occasional thistle offers little protection from the sweep of the wind. On the slope the eggs are in little depressions or footholds in the ground. In some of these depressions dried eelgrass is arranged in the form of a nest, in others the eggs are on the bare ground.

Following along the elevation, as it gradually slopes toward the west, the end of the island is soon reached. This is the narrowest part of the island and consists of little more than two boulder covered shores with a ridge of turf, eight to ten feet in width in some places, and three to five feet in height between them. The entire southwestern end of the island is sparcely covered with dwarf Sumac, Bayberry and wild Roses. These shrubs vary in height from two to three feet near the shore to five or six feet farther inland. They doubtless afford shelter to young Terns that have not yet learned to fly.

Here as on other parts of the island one is impressed by the large number of full feathered dead birds which they see. As no possible enemy may be observed, the only animal one ever sees on the island is a short-tailed mouse, and as the bird's plumage has prac-

tically no market value, one decides that the birds must have met their death, either by accidents in taking flight or in attempts to alight during storms.

Large signs, at either end of the island, warn the public that the birds are protected by law and a reward is offered for the detection of anyone molesting them.

Wee Weepecket, the second island in the chain lies about two hundred to three hundred from the first island. Approaching it from the east side it has the appearance of a high plateau with wind-swept and spray-worn mud banks capped by a layer of thick sod. This relatively level summit, eight to ten feet above water level, slopes at an angle of sixty to seventy degrees down to fringe of boulders, which nowhere offer a sandy beach as a landing place. It is necessary to anchor the boat among the rocks, and make one's way without some difficulties over the slippery, wet rocks, in many cases covered by Fucus and Ascophyllum, to land. After climbing over the outer row of boulders an elevated mass of gravel thrown up by the action of the waves is reached. Here one does not receive as noisy a reception as they did on the Weepecket, for the reason that fewer Terns nest here and many of these doubtless frightened by the cries and behavior of their companions on the other island had already taken flight or joined their neighbors in an attempt to drive off the common enemy. No nests are to be found on the shore, doubtless, on account of the unhospitable conditions existing there.

The top of the island is clothed by coarse beach grass with a few scattered Bayberry shrubs. Here nests are found but they are less numerous as the small size of the island and its level top offers little or no protection from the winds which sweep this region.

The third and smallest of the three islands Wee Wee Weepecket, lies about one hundred feet distant from the second island. It has the same general appearance and offers the same difficulties of approach. It contains only about one-fourth of an acre of land and its surface is even more exposed to the sweep of the storms. There is little of interest on this island as very few Terns nest here.

As one embarks and steers his course toward the harbor, the Weepeckets lie in grim shadow behind. The shrill cries of the Terns gradually die away in the distance, while the quiet lapping of the water affords a restful change.

The Salmon

Jay R. Traver
Willoughby, Ohio

"With slender rod, and line, and reel,
And feather-fly with sting of steel,
Whipping the brooks down sunlit glades,
Wading the streams in woodland shades,
I come to the trouter's paradise;
The flashing fins leap twice or thrice;
Then idle on this grey bowlder lie
My crinkled line and colored fly,
While in the foam-flecked, glassy pool
The shy trout lurk secure and cool."

I think that Izaac Walton would have liked to go fishing with Trowbridge, "to the trouter's paradise." Certain it is that trout-fishing is fine sport, but more exciting game may be found that belongs to the same family as the trout, and is fully as well-known —the salmon.

Especially on the Pacific Coast salmon-fishing is carried on on an enormous scale by the canneries. Of course for their purposes nets are of more value than the hook and line, but for a true fisherman "the feather-fly with sting of steel" stands second to none. The salmon may often be induced to snap at the line during their spring or fall runs up the rivers and creeks, and a big salmon is exciting sport.

During the spring floods and again in the fall the runs of the salmon occur. The full-grown fish come in from the ocean at these times, apparently irresistibly drawn by the currents of fresh water which sweep out from the flooded rivers. Great numbers of luckless salmon are caught in nets near the mouths of rivers at this time. It is almost a tradition that salmon return for spawning to the river in which they themselves were hatched, but rather recent investigations tend to prove that there are absolutely no good grounds for such a belief. It is true that a marked salmon may return to the same river, but then again it may never be seen there again. The reason for salmon returning to their own rivers, when they do thus return, may well be attributed to the fact that the salmon when in the ocean never wander far from shore, and when the call of spawning season comes it may find them actually nearer to the river where they were spawned than to any other. At any rate, the salmon come in from the sea, apparently attracted by the

cold, fresh water in the rivers, and seeming anxious to remain in this cold water.

They reach the mouths of the rivers, and here dally for some time, as though at play, and not yet filled with any serious purpose. This seeming play is accounted for in this way. The general body of the fish is built in such a manner that the fish can progress most easily with its head against the current, and it is in this position that the salmon are found in their progress up the rivers. But in the mouths of the rivers are two conflicting currents, the ebb tide and the flood tide. When the tide ebbs out the fish journey against the current up the river, but before they have gone far the full tide overtakes them, and obeying the instinct to head against the current, they face about again toward the sea. Each day they progress a little farther up the river, and finally get above the point reached by the tides from the ocean.

When they finally really start up the river, their progress is much faster. Salmon on the way to the spawning grounds do not feed. Many investigations show that the pyloric orifice of the stomach shrinks decidedly, so that the fish cannot feed. Moreover, in the males, both the premarillaries and the tip of the lower jaw have been gradually more and more prolonged, till the jaws either shut from side to side like a pair of shears or else the mouth cannot be closed at all. While salmon will occasionally take bait or flies at this stage of their journey, it does not seem to be because they are hungry, but rather because the bobbing object irritates them to a point of recklessness. Should you see the salmon now, you certainly would hardly recognize it as the same fish that was sporting about in the ocean a few short months ago. In the males the peculiar changes in the jaws occur, while the teeth on the tongue and vomer often disappear entirely; the body becomes compressed, and deeper at the shoulders; a distinct hump is formed at the shoulders; the scales disappear, giving place to a spongy growth of skin; the color changes to black and red or blotched. The flesh of both sexes is now inclined to be streaked or very pale pink, owing to the loss of oil. This is true more especially of the salmon of the fall running. As the spawning season approaches, the females also change much in appearance. They lose their silvery color, become more slimy, the scales on the back sink into the flesh. These changes in both male and female are due to the growth of the reproductive organs. It is probable that these organs are not far developed when the salmon first enter the river mouths.

Now that the actual journey has begun, the salmon seem to be in feverish haste to reach their goal. We can only guess as to whether they know where and what it is, and our opinion is that they do not know. We do not yet know enough about the impulses caused by instinct, as we term most animal behavior, to say how much the salmon know of the reasons for their strange migrations. At any rate, migrate up the rivers they do, and are not to be stopped by possible obstacles in their path. The stories of the marvellous leaps of the salmon are very familiar. Even quite high falls the fish manage to leap—that is, the strongest do. This seems to be another case of the survival of the fittest, and the continuation of the race through the medium of its strongest individuals. The salmon may fail many times in their leaping, but persevere bravely ,even when bruised and torn on the rocks, so that finally a goodly number work their way further up toward the headwaters of the river.

The salmon, who have now overcome all obstacles ascend to the headwaters, where, in the gravel beds, beneath the cold, swift-running spring water, the eggs are laid. The male excavates a hole in the gravel beneath rapid water, at a depth of one to four feet. After the eggs are deposited, the hole is covered again with the gravel. The adult salmon then start to descend the stream, tail-foremost. During their trip up the river most of them have been bruised or cut, their fins and tail broken, and their strength nearly exhausted. Parasitic worms enter their gills, fungi begin to grow on the wounded flesh, and it is now positively stated that *all* the salmon die after spawning, long before they reach the ocean again. Quoting from Jordan:—"In the Yukon, a few ascend to Caribou Crossing and Lake Bennet 2,250 miles. At these great distances, when the fish have reached the spawning grounds, besides the usual changes of the breeding season their bodies are covered with bruises on which patches the white fungus develops. The fins become multilated, their eyes are often injured or destroyed, parasitic worms gather in their gills, they become extremely emaciated, their flesh becomes white from the loss of oil, and as soon as the spawning act is accomplished, and sometimes before, *all* of them die."

The young salmon hatch in 120 to 180 days. When hatched, the young start for the shore. In the deep water are a great number of enemies who love to gobble up baby salmon when

chance affords. Near the shore there are fewer enemies, and better chances of obtaining nourishment. Dragonfly larvæ, beetles, even young trout feed upon the very tiny baby salmon now. The salmon themselves feed on spawn of snails, shellfish, gnats, and other small insects. As they become larger they in turn feed upon the dragonfly larvæ, the trout and the beetles. When about three inches in length, they are known as "parr." When the young parr have attained a still greater size, they are termed "smelt." These smelt seem to feel dissatisfied with their surroundings, and begin to float downstream, perhaps in company with adult salmon that have spawned. The smelts at any rate pass down the river and finally enter the ocean. The salt water seems to make them extremely hungry, and they soon become entirely accustomed to their new surroundings. They live quite far down in the water, but probably at no great distance from the river mouths. When about three months old, weighing about five pounds, the young salmon are known as "grilce." A salmon becomes an adult in about three years. Although year-old grilce do enter the rivers to spawn, most of the runs consist of the adult fish.

There are five varieties of the Pacific salmon, the blueback, the dog salmon, the silver, the humpback, and the quinnat or king salmon. Of these, the king salmon, called also the chinook, is the most valuable. The salmon canneries on the Pacific Coast thrive enormously, and canned salmon is well known everywhere. "In mid ocean, the great American canned salmon is often the best and only fish afloat. In the jungles of the Far East, in the frontier bazaar of the enterprising Chinese trader, it 'bobs up serenely' to greet and cheer the lonesome white man who is far from home and meat markets. Even in the wilds of Borneo its name is known and repeated, and he who goes beyond the last empty salmon-tin, truly goes beyond the pale of civilization. The diffusion of knowledge among men is not much greater than the diffusion of canned salmon and the farther Americans travel from home, the more they rejoice that it follows the flag."

There are also Atlantic salmon, not so often heard of nor of so much value commercially. Of these Atlantic salmon, the Ouaniche is perhaps best known. These are truly fresh-water fish at the present time, and are often termed 'land-locked salmon.' They are perhaps the gamiest of any fish of the tribe of salmon. Van Dyke speaks of them thus: "But the prince of the pool was the

fighting Ouananiche, the little salmon of St. John. Here let me chant thy praise, thou noblest and most high-minded fish, the cleanest feeder, the merriest liver, the loftiest jumper and the bravest warrior of all creatures that swim! . . . The old salmon of the sea who begat thee long ago in these inland waters became a backslider, descending again to the ocean and grew gross and heavy with coarse feeding. But thou, unsalted salmon of the foaming floods, not landlocked as men call thee, but choosing of thine own free will to dwell on a loftier level in the pure, swift current of a living stream, hath grown in grace and risen to a better life." All fishermen love a gamey fish, and the Ouananiche is certainly that.

No tale of fishes or fishing would be complete without further mention of Izaac Walton and his august and learned opinion on such subjects. So at the last let us turn to him for an all-inclusive, brief description of salmon.

"The Salmon is accounted the King of fresh water fishes, and is ever bred in rivers relating to the sea; yet so high, or far from it, as admits of no tincture of salt, or brackishness. First, you shall observe that usually he stays not long in a place, as Trouts will, but as I said, covets still to go nearer the spring-head. And lastly, I am to borrow so much of your promised patience, as to tell you that the Trout or Salmon, being in season, have at their first taking out of the water, which continues through life, their bodies adorned the one with such red spots and the other with such black or blackish spots, as give them such an addition of natural beauty as, I think, was never given to any woman by the artificial paint or patches in which they so much pride themselves."

Fish Fighting

The Siamese have cultivated a breed of fighting fishes. These little duelists are not two inches long but they are full of grit. When in an amiable frame of mind the fighting fish is dull colored but the moment he sees his foe his fins and whole body shine with mettalic colors that are fairly dazzling. He first sizes up his enemy and then darts at him trying to damage his side or tail fins. Two will often fight until exhausted but still keep at it; and it is sometimes difficult to part them. Often a sum equal to thirty or forty dollars is bet upon a favorite fighting fish. A very interesting account of this fish is given in the January number of Aquatic Life.

A Method of Fish Study For Beginners

G. C. Embody
Professor in Charge of Fish Culture at Cornell University

During the past summer it was learned that only a very few members of a certain class for teachers of nature-study had ever studied fishes. Two principal reasons were implied in the answers to the question as to why this was so. First, specimens were difficult to obtain and exhibit at the desired time, and second, the names of even the common fishes were unknown and the *keys* were too technical to be useful for beginners.

With reference to the first, it may be said that almost any permanent stream or pond will yield a sufficient number of fishes to start with. One need only to go after them with a hand net and pail or in the absence of such an inclination, that boy, who is always awaiting an excuse to go afishing, may be put to good use. Four or five common fishes such as the horned dace, sucker, bullhead and sunfish will serve to acquaint one with the different characters upon which identification is based and when these are briefly described in notebook there will be acquired a fair foundation for continuing the work with the aid of keys.

In the nature-study work with which the writer has been identified, fishes have come in for their share of attention with other animals. It has been customary to use in the beginning just the forms mentioned above, for they are quite generally distributed throughout the northern states from the Mississippi River eastward and they are easily identified after study by means of pictures to be found in several good books on fishes. When classes were small they were taken to the brook or pond and the various members assisted in the capture of specimens which were studied immediately in glass jars of water. In the case of large classes, it was necessary to obtain specimens beforehand and to exhibit them in battery jar or rectangular aquaria. Ten different kinds of fishes distributed in as many aquaria gave ample opportunity for forty students working at one time and by duplicating certain aquaria, a much larger number was accommodated.

The plan of study consisted of three parts as follows:

1. Pointing out the recognition characters in the horned dace and comparing with them those exemplified in the sucker, bullhead

and sunfish. This was accomplished by well directed questions and with living specimens before the student.

2. Recording in notebook brief descriptions of the characters exhibited by about ten different kinds of fishes. Here also living specimens in aquaria were before the student and the work done was largely individual although closely supervised by the teacher.

3. Classifying the fishes studied and working out individual tables or keys for same.

An outline that has been found useful in recording the observations in part two, is reproduced here as properly filled out for the horned dace. This may likewise form the basis of the questionnaire in part one. It should be noted that in describing recognition characters one need only to underscore the particular term which applies to the species in hand thus reducing the amount of writing to a minimum.

FIELD NOTES ON FISHES

Outline

Name of Fish Horned Dace. Date Aug. 2, 1916.

See picture, page Waters visited Cascadilla Cr.

(Underscore the words applying to the particular species at hand.)

Where seen: small brook, creek, river, pond, lake

1. Kind of water: cold spring, warm; clear or roily; rapids or pool; in vegetation or barren places.

2. Kind of bottom: mud, sand, gravel or rocks.

BODY. Form: compressed or cylindrical.

HEAD. 1. Form: compressed, depressed, conical.

2. Barbels or feelers: present, absent, minute.

3. Teeth: long and sharp, short and in pads, absent.

4. Operculum: with or without scales.

5. Cheek: with or without scales.

6. Mouth: terminal, subterminal; sub-superior; inferior.

7. Premaxillary bone: movable forward, or fixed.

8. Gill membranes: free or joined to isthmus.

FINS. 1. Dorsal: equal to or shorter than anal fin where joined to body;
single, or partly or wholly divided;
soft rays only or both spines and soft rays;
dorsal fin formula. D 7 or 8.

2. Adipose fin: present or absent; free or joined to tail fin.
3. Caudal or tail fin: sketch its shape accurately.
4. Pectorals: armed with a spine or soft rays only.
5. Ventrals or pelvics: abdominal or thoracic in position.

LATERAL LINE: continuous, broken or absent; straight, curves upward or downward.

SCALES: large, medium, minute, wanting; smooth or rough. (To determine them, pass finger over side of body from tail towards head).

COLOR AND MARKINGS.

1. General ground color { back Dusky. / sides Bluish iridescence / under parts Silvery.
2. Longitudinal stripes { location Sides / extent Cheek to tail / color Black } In young of both sexes
3. Vertical bars { location / extent None. / color
4. Spots, blotches, mottlings, brilliant coloration.
Location and color Black blotch in front lower angle of dorsal fin.

SEX DIFFERENCES.

1. Pearl organs on male. Where? On head at breeding time only.
2. Conspicuous colors or markings on male. Where? Reddish on under fins and belly at breeding time.

FOOD consists of what?

Aquatic insects, small crayfish, young fishes and occasionally algæ.

EGGS. Where are they deposited?

In a depression in gravel shoals running water.

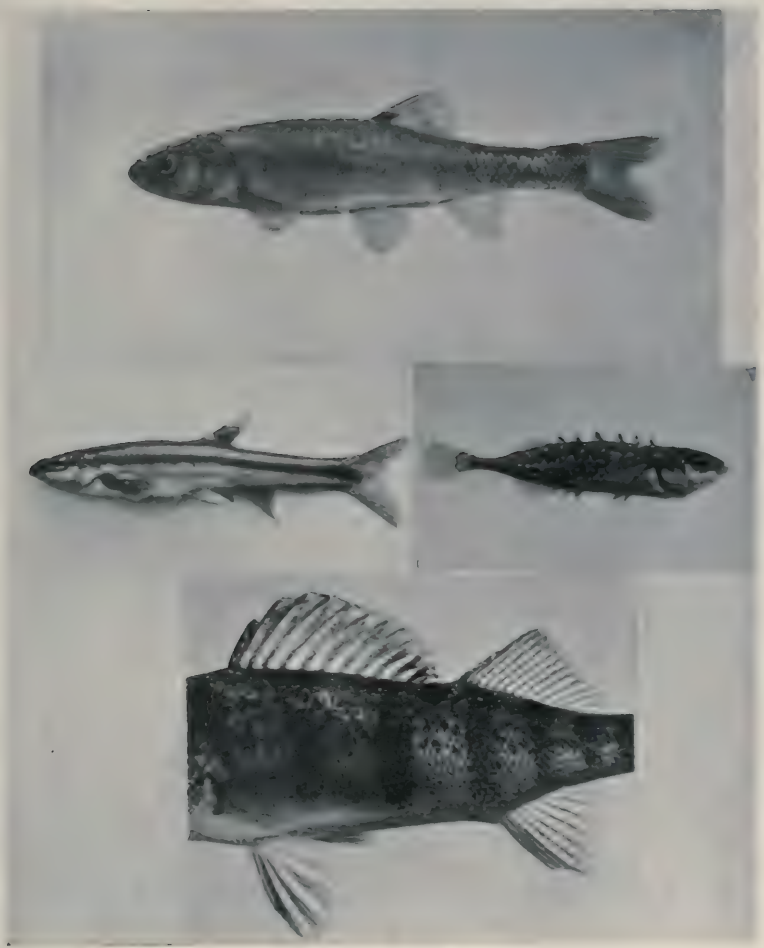
Does this fish guard eggs and young?

No parental care.

MISCELLANEOUS.

In order to illustrate the third part of the program—classification and key building—let us suppose that we have outlines filled out for the following:

Horned Dace	Brook Trout
Black-nose Dace	Sunfish
Sucker	Yellow Perch
Catfish	Stickleback



We may begin by directing the student to arrange the fishes in two columns, one containing those in which the ventral fins are abdominal in position and the other those where the ventral fins are thoracic. Thus:

A. Ventral fins abdominal	AA. Ventral fins thoracic
Horned Dace	Stickleback
Black-nose Dace	Yellow Perch
Sucker	Sunfish
Catfish	
Brook Trout	

The fishes under A may be further sub-divided by the presence or absence of an adipose fin:

B. Adipose fin present	BB. Adipose absent
Catfish	Horned Dace
Brook Trout	Black-nose Dace
	Sucker

The catfish may be separated from the brook trout as follows:

C. Barbels or feelers present, pectoral fin with spine, scales absent. Catfish.

CC. Barbels absent, pectoral without spine, scales present but minute. Brook Trout.

In like manner we may divide and sub-divide the successive groups until we have finally separated each species from every other and then arranging the different headings in commonly accepted form, a key similar to the following is likely to result:

A. Ventral fins abdominal
  B. Adipose fin present
    C. Barbels present, pectoral fin with spine, scales absent. Catfish.
    CC. Barbels absent, pectoral without spine, scales minute. Brook Trout.
  BB. Adipose absent
    D. Mouth terminal, a black blotch in the lower front angle of the dorsal fin. Horned Dace.
    DD. Mouth subterminal, dorsal without black blotch, conspicuous lateral stripe, passing through eye and tip of snout. Black-nose Dace.
    DDD. Mouth inferior. Sucker.
AA. Ventral fins thoracic.
    E. Dorsal preceded by four or more free spines, ventrals reduced to a single spine each. Stickleback.
    EE. Spines in dorsal all joined with a membrane.
      F. Dorsal wholly divided into two fins—Yellow Perch.
      FF. Dorsal notched but not wholly divided, body deep about equal to one-half the length. Sunfish.

The writer has found that the building of individual keys interests even beginners. Since it constitutes one very definite purpose for note taking, it has a tendency to inspire greater accuracy in the latter. After learning to recognize a few of the common species, one may turn with greater pleasure to the study of habits and the conditions under which the various forms live. Identification will be the more certain and accordingly the field observations having to do fish with activities will have the greater value.

An August Day Duel

HELEN LEE SHERWOOD
New York City

ONE warm August afternoon a thread-waisted mud dauber was very busy collecting spiders for her larvæ when they should hatch from the eggs she was laying. She was a graceful, slender wasp with a long thread-like waist, and in the sunlight her armoured body was of a bright metallic blue. She had been building a nest of five, long, delicate columns of gray mud, placed side by side like the pipes of an organ and finely etched where each layer of mud had dried. It had taken long, long hours and many trips back and forth to the clay-bottomed pond some hundred feet from the hay mow on one of whose rafters the nest was built, but the little wasp had enjoyed her swift flights in sunlight and her skillful architectural work. She had rejoiced to see how quickly each bit of clay or mud had helped to lengthen the wonderful cells she built. Now it was late in the day and three cells were filled with spiders that she had caught and stung. In each finished cell there were ten or more little spiders, some dead and some only paralyzed, packed tightly together, and on one of these in each cell was a tiny wasp egg. The mother had closed each cell as she laid an egg, and in two or three days a tiny, blind, white grub would hatch and begin to grow very fast as it ate one after another of the juicy spiders around it. When they were gone and the baby wasp had grown large and strong it would spin a soft cocoon all around itself and spend the long winter sleeping, as a pupa. In the spring a limp, little wasp with a soft body and helpless wings would break

its way out of the mud cradle, dry its wings in the sunshine, and fly away without ever having seen its mother.

The wasp had finished the fourth of her cells and had stored it with two spiders, but she must find many more to fill it. The sun was very warm and she flew slowly. Through her strange compound eyes she saw green, sunny things and bright flowers, and many insects flying by. She was flying low and watching for spiders, when she came close to the steps of a porch. She could not see the house nor the porch nor even all of the steps, but her many eyes showed her a vast, dark place and white wood. She flew quickly toward it, under the lowest step. There would be spiders here, no doubt, said the strange instinct that had taught her all she knew of wasp life. It was this silent, hidden instinct that had taught her to use so deftly her fine, sharp mandibles and long, thread-like fore-legs and to build the exquisite clay tubes where she had laid her eggs. And the same secret thing that she trusted though she had never seen it, was bidding her store spiders in each wasp cradle, though I think she never knew the winter was coming nor even, perhaps, that her little grubs would be hungry. She worked and worked joyfully—but perhaps she never asked or guessed why!

a. *b.* *c.* *d.*

A mud-dauber and her nests, with cells cut open showing a, larva full grown; b, cocoon; c, young larva feeding on its spider-meat and d, an empty cell.

So she flew under the step—and was stopped, with a shiver, in mid air by threads she had failed to see, or to feel with her quick antennæ. The threads were almost too fine to see in the shadow, but were sticky and clinging. She shuddered with a deadly instinctive fear, and pushed with all the strength of her wings and legs, but the threads clung more closely and tightened and entangled themselves in the fine hairs on her legs. Then the whole wheel web shivered as a shadow dropped from beneath the step, and the wasp felt two swift, sure, thread-like legs tickling the tips of her own legs.

If you had been watching just then, you would have seized and killed the little, cruel brown spider that danced in her web on six of her eight legs and seemed to be tickling her horrified victim with her fore-legs just for the demon-like joy of teasing her. You would have had to look carefully to see the elf thread she was pulling from a tiny opening beneath her abdomen and weaving with magic speed from one to another and another of the wasp's struggling feet. In a second or so the wasp found all six bound together in a clinging mesh of thread, finer than the very hairs on her body but woven so it could never break! She had been twisting her thin, long "waist" with all her strength in her efforts to reach the Spider with the sting-armed tip of her abdomen, and now she gave the most violent, desperate twist of all. But the nimble Arachnid was suddenly tickling the top of her thorax! Then she had gone, running like a brown shadow up the web to the step. She stopped and pressed the under side of her body firmly against the step at the opening where the thread unraveled. Thus fastening the thread from the wasp's thorax to the roof over her web, she hung, thoughtfully watching, while her victim twisted and jerked, tangling herself more hopelessly and wasting her strength.

In another moment the tired wasp felt her thorax being tickled and then her wings. She jerked them desperately, but one little hind wing was already tied to the net that bound her legs. She twisted her abdomen but the spider's instinct told where her enemy's weapon was, and she stayed out of its reach, spinning more nimbly than the goddess, Arachne, had ever spun till the wasp's wings were caught and tied. Then, fastening a second thread to the thorax, she ran up to the web's roof, holding it tight. Here she drew it up till it pulled the wasp up slightly, and fastened it to the step. As the wasp struggled in a nearly hopeless and very tired manner she tangled her delicate wings and legs more completely. Can we ever know whether her insect memory flitted back to her half filled cell, when her wings were no longer free to take her there? She would have flown home at once if she had been suddenly freed, and perhaps she would have caught and taken the spider with her, but would her instinct ever remind her of something she *could not* do?

When the brown shadow fell down again it danced about her head for an instant, tightened the threads on her wings and legs,

and then grew suddenly bold and tickled the top of her abdomen. The spider was skillful in her boldness, too, for she danced and tickled so quickly from top to bottom and from side to side of the wasp's writhing abdomen that the sting could never take aim. Soon only the tip with its sting was left unbound, and the spider fastened a thread to the front of the abdomen, drawing her victim up farther as she ran up her web. Down she dropped again and caught the wasp's head with a thread, pulled her up and fastened the thread to the step, and then dropped down again to repeat her trick.

The wasp could not resign her life even when she was hanging high up at the top of the web, with her legs, wings, body and head entangled in meshes of clinging silk. She struggled feebly without ceasing and a deadly shiver of pain ran through every part of her as the eager spider pierced a soft place in her neck. The spider sat for a long while slowly sucking the life juices from her prisoner, as if with an evil joy in the wasp's writhings as she died. Do you think the instinct that had taught her so well how to capture this dangerous creature much larger and stronger than herself, heightened her cruel joy by reminding her what the wasp had come flying hither in search of?

War and Nature

John Price Jones
Assistant Director, in Charge, Press Bureau Liberty Loan Committee

(Written exclusively for the *Nature-Study Review*)

While the horrors of the world war precipitated by ruthless ambition have shocked Americans of all classes, to none have the devastations been brought home with such poignancy as to nature lovers. The appalling loss of life must overshadow all else, but to the outrages committed upon mankind have been added destruction of Nature that has been fiendish.

To most of us who have enjoyed the intimacies of Nature, the thoughts of the mutilations and the desecrations she has suffered at the hands of those who have attacked her deliberately and maliciously must arouse deep disgust and determination to do all in our power to end these conditions as soon as possible. There is only one way that they can be stopped. The war to

end war must be prosecuted with new vigor. America must hasten to make the world sweet as well as safe for the peoples of the earth.

To do this requires money—huge sums of money such as almost stagger the imagination. They must be furnished, and they will be furnished.

It may seem strange to readers of THE NATURE-STUDY REVIEW that we should be discussing war in the columns of this publication. It is only one of many anomalies caused by the conflagration started by those who have shown a positive hatred of all that is beautiful in nature and in Art as well as in mankind. But we feel that we have reason. To study and to admire nature in these coming days when she appears in her most charming garb, is to be saddened by the obtrusion of the vision of whole countrysides laid in waste, of shrines of nature-lovers in all parts of the world violated or obliterated.

It is for this reason that we urge every reader to work earnestly and faithfully for the success of the Third Liberty Loan. It may be necessary for some of us to forego the trips planned and anticipated for twelve months in order to subscribe liberally to the loan. Let us make the sacrifice rather than fall short of our full duty and privilege. Fortunately, we can consider many interesting aspects of nature without going far afield. We shall be happier and more satisfied in our work if we enter upon it with the knowledge that we have helped our country, and in helping her, have helped the cause of humanity, by modifying our plans.

It is not sufficient that we should wish this war to end. It will not end because some of us wish it to end. We have to work to bring about a permanent peace, and the harder we work, the sooner our wishes shall become accomplished fact.

At every gathering of nature-lovers this matter of subscribing to the Third Liberty Loan should be made subject of discussion and mutual encouragement. Where two or three are gathered together let the spirit of emulation be fostered. Men who are not interested in those things which are our particular study and happiness have taken off their coats and are working night and day in preparation for the campaign. It would be a cause for shame if we lagged behind in the cause.

Humane Education

The Proper Treatment for Goldfish

The best place to keep goldfish is in a balanced aquarium. To make this, place at the bottom of the aquarium a layer of sand; in this we plant any water weeds we find living entirely beneath the surface, placing a few small stones upon them so as to hold them fast. Now place a sheet of paper over them and pour in water gently until the aquarium is nearly full; then remove the paper which was used to prevent the uprooting of the plants while the water was being poured in. In such an aquarium the oxygen given off by the plants keeps the water pure so that it does not need to be changed. The aquarium should not be kept in the strong sunlight or its sides will become covered with a green slime which is a low form of vegetation.

For cleaning this aquarium we should have a glass pipette long enough to reach the bottom. The Acton Electric Co., 1133 Broadway, New York, have devised an aquarium vacuum cleaner which is very efficient. Frog tadpoles introduced into this balanced aquarium prove helpful in keeping down the growth of low vegetation.

The ordinary fish globe is not fit for an aquarium because its curved sides allow but a small portion of the surface of the water to come in contact with the air if it is filled to the brim. Often goldfish die of suffocation when kept in these globes. If a globe must be used it never should be filled more than half full and thus leave as large an area of the surface of the water as possible in contact with the air.

If a balanced aquarium is not used the water should be changed at least three times a week. In changing the fish, remove them by hand or with dip-net to a pan of water while the aquarium is being emptied cleaned and refilled. Care should be taken that the water in the pan and the fresh water in the aquarium should be as nearly as possible the same temperature as that from which the fish were removed.

If practicable the aquarium should be set near a north or an east window: a window-shade should be used to regulate the light so that in the summer the aquarium does not become heated by direct sunlight. In winter the fish should have all the sunlight possible in our northern climate.

How to Feed Goldfish.—Often goldfish die from overfeeding. They should be fed once a day in the morning at a regular hour; be careful and feed only what the fish will eat since waste food contaminates the water. The excreta of the fish should be dark colored and brownish or greenish; if it is whitish or yellowish the fish are being overfed and should not be fed again for two days.

The food for goldfish is of two kinds, animal and vegetable; there are many good standard animal foods which should be fed in small quantities. The goldfish are essentially vegetable feeders and vermicelli, oatmeal or rice wafer should be given with the other. Bread of any sort that has yeast in it should never be given to goldfish.

Common pond snails, the young of water beetles, dragon flies, water boatmen, crayfish, salamanders, newts and turtles should not be kept in an aquarium with goldfish. Shiners, dace, and suckers if not too large, are safe companions of the goldfish.

If the colors of the goldfish fade and they lose appetite they are probable suffering from suffocation. A fish showing these symptoms should be put into fresh water to which has been added a teaspoonful of salt. It should be kept in a warm situation and given no food for a few days. Small quantities of food should be given when the feeding is commenced.

Questions

1. How can an aquarium be made so that the water will keep fresh without changing it?

2. What gas is it that plants give off that keeps the water fresh?

3. Describe how to make a permanent aquarium.

4. Why should the aquarium not be kept in strong sunlight?

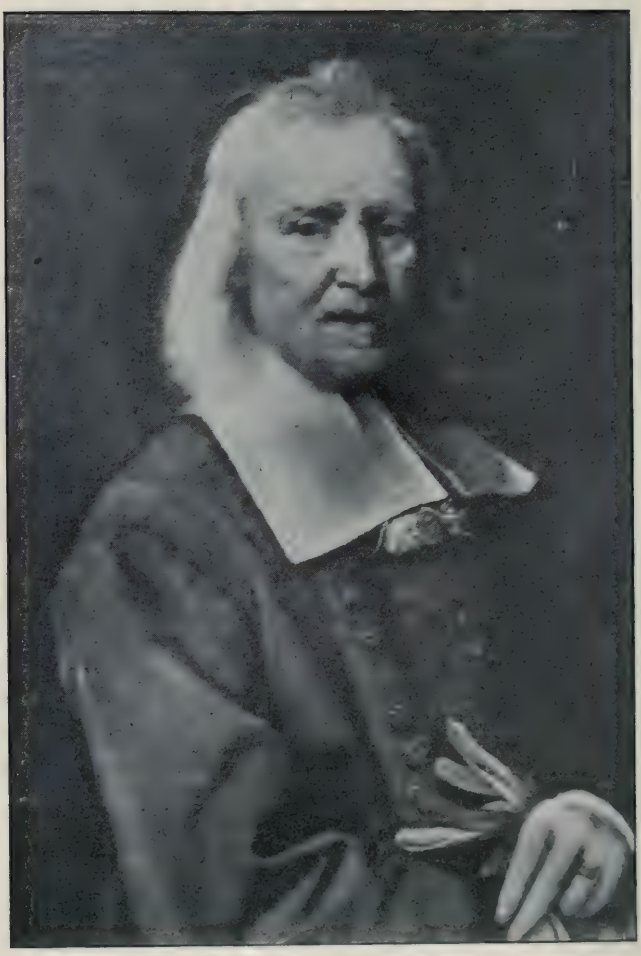
5. If a permanent aquarium is not used how often should the water be changed? Why do the fish suffocate in stale water?

6. Why are fish likely to suffocate in the ordinary fish-globe? How does a goldfish look when it is suffering from suffocation? What do you do to save a fish in this condition?

7. In changing the water in an aquarium, why should the fresh water be the same temperature as that from which the fish was taken?

8. How often and how much should goldfish be fed?

9. What other water creatures may be kept in the aquarium with goldfish without harm to them? What ones will surely harm the goldfish?



Isaak Walton.

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

Isaak Walton

Through the dust of changing centuries, there has trickled down to us of the present day a brook of purest water,—sometimes meandering and doubling upon itself in level green meadows and sometimes dashing over rocks and plunging over falls. From this brook many a soul has quaffed a refreshing drink and has paused to watch the graceful creatures that lived within its depths and has listened to the throstle singing above it. It is a stream that has gained as the years passed on and has lost none of its waters or its freshness. It is the stream on whose banks wandered the man whom we lovingly call "Old Isaak Walton,"—old because he is eternally young and always a happy and charming companion.

That the opportunity for thought and close companionship with nature were among the chief attractions that angling possessed for Isaak Walton no reader of the "Compleat Angler" can doubt. He says: "It remains yet unresolved whether the happiness of a man in this world doth consist more in contemplation or action. Concerning which two opinions I shall forbear to add a third by declaring my own, and rest myself contented in telling you, that both these meet together, and do most properly belong to the most honest, ingenious, quiet, and harmless art of angling. And first I tell you what some have observed, and I have found to be a real truth, that the very sitting by the riverside is not only the quietest and fittest place of contemplation, but will invite an angler to it."

Isaak Walton was born in 1593 and died in 1683. If we glance over the history of England covered by the period of his life, we find it began during the last years of Elizabeth's reign and ended

during the last years of the reign of Charles II. These pages of history reek with bloody wars, black intrigue, religious persecution, rebellion, horrors of the plague, and the stern excitements of regicide. These national tribulations find no mention in the serene, sweet, sunny pages of Walton; pages on which no shadows rest save those made by the foliage of trees or the pinions of a hawk climbing his skyward spiral above green English meadows. In Walton's book the sea was never made for armadas and ships seeking conquest of new countries and vast riches; nor yet for the Mayflower and religious freedom do his blue waters roll. But rather for ships that shall bring or carry the art of Italy and the learning of Livy and Tully; and above all does he prize the seas because of the teeming life in them and says: "The waters are Nature's storehouse, in which she locks up her wonders." And adds: "An ingenious Spaniard says that rivers and the inhabitants of the water element were made for wise men to contemplate, and fools to pass by without consideration."

It is only by thus considering the history of his country during Walton's life, and contrasting its turmoil with the serenity of his spirit that we can understand him fully. We are told that he was persecuted for religious and political opinions and that he felt deeply and lived keenly with his times; so we come to understand that it was from sheer self-preservation that he turned his back upon the struggle and bitterness of civil strife, and turned his face toward nature and his art of angling, which made him forget that earth was less than paradise.

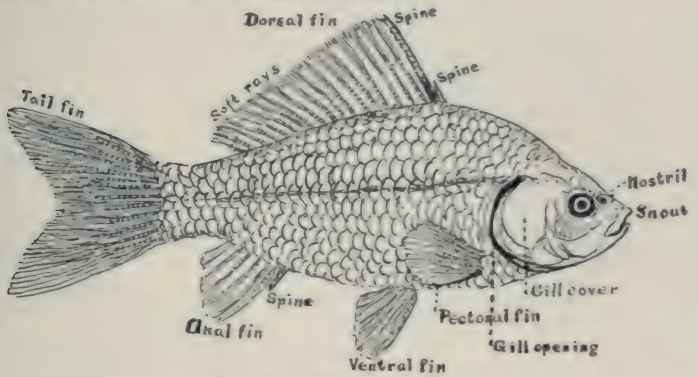
"Any other brooks in any other shire would have served just as well, save, that but one brook, at one time, could have had its Isaak Walton. But the beauty he disclosed was not that of brooks and woods. It was the delight of restfulness, the charm of the open mind, the mind of him who is not in a hurry, who envies not and hates not, who hath no fever in his blood, and asks for nothing which life and sunshine may not freely give."

—David Starr Jordan.

Teacher's Corner

The goldfish seems to be made especially for the teacher to use in demonstrating the fish's wonderful adaptations to a life in water.

First of all we look at the shape of the fish. Looked at from above it is wedge-shaped or rounded in front; looked at from the side the shape is a smooth oval. Thus its form in every way is adapted for moving through the water swiftly. A little exercise to prove this might be as follows: Cut a model of a fish from a piece of shingle or a thin piece of wood, submerge it by holding it down, and then move it lengthwise and crosswise; even a little child can see the effect of this experiment. Next we note the fish's covering, which is an armor of scales as smooth as glass, overlapping like shingles on a roof; they are directed backward and thus by the smoothness of these scales the fish is enabled to move more swiftly through the water.



Goldfish with the parts named.

This figure should be copied on the blackboard for reference.

The next point of observation naturally is how does the fish move? Why does it not have legs and arms like ours? The answer is that no man, however expert in swimming, can swim so rapidly as a fish. The fish's fins are specially adapted to drive it swiftly through the water. The goldfish has seven fins: One pair just back of the gill openings, which morphologically represents our arms or the front legs of an animal—these are called the pectoral fins; below and back of them is another pair of fins which may be compared to our legs or the hind legs of an animal, and are called ventral fins; along the back is a fin that may be raised or flattened at will—it is called the dorsal fin; the fish's tail is the tail fin, and on the lower side just in front of the tail is the anal fin.

The reason we take any interest in all these seven fins of the fish is because they help the fish to move and therefore we are as interested in them as we are in a bird's wings. The dorsal fin, when lifted, can be twisted to one side or the other. This helps to steer the fish just as the rudder helps to steer the boat. The anal fin on the lower side helps in a similar manner. The tail fin is the propeller. It is pushed first this way and than that against the water and thus sends the fish forward. The two pairs of fins help the fish to keep its balance

and also help it somewhat in its movements. The children enjoy watching the fish in the water and will soon make observations on the way the fins are used.

A common mistake is a belief that a fish is somehow able to dissolve water into its elements hydrogen and oxygen, and thus get the oxygen to breathe; this is not possible and the fish breathes the air which is mixed with the water; the fish like ourselves breathes air and thus gets its oxygen but the fish cannot breath air unless it is mixed with water. In breathing, the fish constantly opens and shuts the mouth thus taking the water which flows over the gills and out through the gill slits.

Lesson on a Goldfish

1. What is the shape of a fish when seen from above? Where is the widest part? What is its shape seen from the side? In how many ways is the shape of the fish adapted for moving through the water?

2. Study the covering of the fish. In which direction do the scales seem to overlap? Of what use to the fish are the scales? Note a line which extends from the upper part of the gill opening, along the side to the tail.

3. How many fins has the fish? Make sketch of the goldfish with all its fins and name them from the diagram on the blackboard.

4. Which pair corresponds to our arms? Which to our legs?

5. Describe the pectoral fins. How are they used? How do the ventral fins assist the fish when simming? Study the dorsal fin. How many spines has it? How many soft rays are there in it?

6. Study the anal fin. Has it any spines in front? How many rays has it? How is this fin used when the fish is swimming?

7. With what fin does the fish push itself through the water? Are the rays of the tail fin spiny or soft in character?

8. Watch the goldfish swim and describe the action of all the fins while it is in motion. In what position are the fins when the fish is at rest?

9. Note carefully the eyes of the fish. Can you see the nostrils? Describe the mouth of the fish.

10. Is the mouth kept always in motion? Note a wide opening along the sides of the head behind the gill cover. Does the gill cover move with the movement of the mouth? How does a fish breathe?

"Go with me down by the stream,
Haunt of bass and purple bream;
Feel the pleasure, keen and sweet,
When the cool waves lap your feet;
Catch the breath of moss and mould,
Hear the grosbeak's whistle bold;
See the heron all alone
Mid stream on a slippery stone,
Or on some decaying log,
Spearing snail or water-frog;
See the shoals of sun-perch shine
Among the pebbles smooth and fine,
Whilst the sprawling turtles swim
In the eddies cool and dim!"

Maurice Thompson.

News and Notes

CALIFORNIA

Fom California Nature-Study League, care of C. M. Gœthe, 720 Capital National Bank Bldg., Sacramento.

(*Reprint from Sacramento Bee*)

The pussy willows, the first harbingers of spring, are here. Numbers of children are to be seen returning from the places where the willows grow, carrying the branches which they enjoy placing in sunny windows, so as to watch the catkins burst into bloom.

The willow was to the California Indian what the bamboo is to the primitive Japanese and the cocoanut palm to the natives of the Spice Islands. Just as the bamboo thatch is used in Japan and cocoanut palm thatch in the huts in the jungles, so the Indians used the willow branches as a thatch for their summer houses. The willow twigs were used in basket making. A part of the wood was utilized for tinder, for the Indians, of course, had no matches. The wood was used for arrows, also for fishnets. The inner bark was woven into rope and into cloth. It was also made into a kind of tobacco. The leaves, also the bark, were utilized medicinally.

The whites, too, have not been indifferent to the willow's value. Along the canals of Holland, willow twigs are harvested for basket making as regularly each year as is the grain that is ground by the broad-armed Dutch windmills.

All California children should look forward to the blooming of the willow catkins. They should learn to know the willow pine-cone gall, and other galls made by insects, who also find use for the willow. There are three very well known varieties of willow trees through California, and several others not quite so common. Those who love the storm blown Sierran Peaks are always happy when they find the tiny Arctic willow, that has crept down the snowclad range from the land of polar bears and Eskimo. This tiny willow, evolved to survive in the most severe climates, is hardly taller than the length of a man's finger. Yet it bears catkins just as perfect as the trees of the warm California valleys.

Parents and teachers interested in instructing children how to read a roadside as they would a book can find a simple way of distinguishing between the willows in "Trees of California," by Dr. Jepson, of the University of California. This book can be had through most of the 2141 branches of the County Libraries of California.

ILLINOIS

Miss Alice Jean Patterson of Normal, gives the following cheering item:

You may be interested to know that our Children's Garden Club did better work than ever this year. We had at the close of the year 337 members, who brought displays, either flowers, vegetables, or canned goods, for the exhibit on Garden Day. Sixty-three handed in itemized reports of expenditures, receipts, and profits. The profits netted $592.93.

PENNSYLVANIA

North East. The North East Nature Club is preserving its vitality during the winter, as indicated by the following suggestions from Mr. Cushman:

Nature Notes

Our Nature Club has donated a moth book, by Holland, to the public library. This is a companion to the butterfly book by the same author that was added to the library some time ago. The illustrations in both are colored to nature. The Holland insect books rank high.

Now is the time to take down your bird houses, renovate them and make any needed repairs. Should vermin be found in any of them, as is quite likely to be the case, put them in a tight box or barrel and smudge them with sulphur fumes. Then lay them away out of reach of English sparrows until spring. Bluebirds will be the first to need them. They come soon after the first robins.

The stately and beautiful grackle, commonly known as crow blackbird, is getting into ill repute here. They go in great flocks and can make short work with a tree of cherries. I know of several instances here this year where they came in great flocks and took two or three bushels in that many days from people who had but one tree—literally skinned the trees; took all they had. The law lists them as game birds, and provides that they may be shot in October and November. A queer law, for they are not here then; have gone south. The law allows of their being killed at any time by a land-owner, on his premises if detected in the act of destroying the young or eggs of other birds, of pulling corn, or of taking fruit; but for various reasons that does not fill the bill. They belong in the category with the English sparrow, and deserve no favors at our hands. Conservation and economy call for a great reduction in their number.

Field Book of Insects. Frank E. Lutz, Ph.D. 509 pages with about 800 illustrations, many in color. G. P. Putnam's Sons. Price, $2.50.

The Putnam's have added another attractive volume to their Field Book series, and which is perhaps the most ambitious of them all since it covers a field so large as to seem discouraging at first sight. However, Dr. Lutz has done his work well and has made a felicitous choice of insects to describe in his book. Dr. Lutz is a curator in the American Museum and has had much correspondence about insects with the laiety and has therefore been able to judge well of the kinds of insects that they find interesting. The plan of the book is like that of the Field Book of American Wild Flowers; it is plentifully illustrated by Mrs. E. L. Beutenmüller whose pen drawings are graphic and accurate. The colored plates are very attractive and well done. On a page in the near vicinity of its picture is a description of the insect and its habits. Dr. Lutz writes in an attractive style and makes his subject interesting. The book has many keys to families but we venture to say these will not be used much by the untrained naturalist. The great value of the book to the public are the graphic and condensed descriptions, the pictures and the size which permits it to be carried in the pocket. The volume is a valuable addition to popular entomological literature.

The Third and Fourth Generation. Elliot R. Downing. 164 pages. The University of Chicago Press. Price $1.00.

The young people of this day and generation certainly have a chance to walk with eyes open avoiding pitfalls. This compact little volume by an eminent scientist and teacher has been written especially for young people and is intended to be used in the Sunday Schools and the public schools. In it are given in simple and understandable terms the scientific facts regarding eugenics. As Dr. Downing so well says in his introduction: "This book is intended primarily for young people. They can most readily break way from the whims and prejudices of the past and adopt a new set of ideas as adequate grounds for new habits. They live only in this sicentific age when we have an increasing respect for facts, reason on them to correct conclusions, and base on them our sense of duty. They are practical optimists, and what seems an impossible dream of the visionary to an older generation, hide-bound by preconceived notions and social tradition, comes to be, for valorous youth, a simple accomplishment dictated by good sense."

The following topics are discussed in separate chapters: Some famous racers and the problems they suggest; male and female; some laws of heredity;

man a creator; the visible basis of heredity; some apparent exceptions; are acquired modifications heritable? the inheritance of human characters, physical and mental; the practical problem of human heredity. At the end of each chapter are questions which will lead the pupil to make his own deductions from the facts given.

We confess that we have lingered the longest over a chart on which is tabulated the pedigree of Alix, a famous race horse. This is a most graphic representation of the fact that "Blood will tell." A very valuable list of references for further reading is given at the end of the book. We predict a useful and successful future for this important little volume.

Fresh-water Biology, by Henry B. Ward and George C. Whipple, with the collaboration of a staff of specialists. J. Wiley & Sons, New York City. $6.00.

Among the recent books dealing with the plant and animal life there is none more welcome to the student of nature than this 1100 paged, richly illustrated volume upon the life of pond, lake and stream. By its means most of the smaller freshwater plants and animals of this country may readily be determined. The first few chapters deal with general biological factors. Following these are twenty-seven chapters upon bacteria, algæ, larger aquatic plants, protozoans, sponges, hydrozoans, free living and parasitic worms, rotifers, crustaceans, mites, insects, bryozoans, mollusks, and fish. A sixteen page chapter on "Technical and Sanitary Problems," the junior editor's contribution, completes the volume. In each chapter, descriptions of special methods of collecting, preserving, and studying the organisms of the group considered, are given, followed by a key for the determination of the genera and in many cases, species. The descriptions are concise and the illustrations, though simple, are adequate. Each chapter has been written by a well-known specialist, twenty-five collaborators having assisted the editors in their work, thus rendering the production far more authoritative than if written by one individual. The treatment is conservative in the matter of scientific names: in a number of instances we note that an old and well established term is used in preference to one which is in strict conformity with the usages of the international code of nomenclature. This, however, in the opinion of the reviewer, is commendable, in a general work of this kind. The bibliographies following the chapters, though confessedly brief and incomplete, are for the most part well selected. Considering the vast field that is covered and the number of collaborators, the work is quite uniform in its manner of presentation.

Judged by its title alone it would appear that this book duplicates in substance, that of Needham & Lloyd "The Life of Inland Waters" reviewed in these pages in 1916. A comparison, however, shows that this is not the case, the earlier work is upon the natural history of the life in fresh water, while the present volume is primarily designed for the identification of the various organisms found there. The former emphasizes the ecologic, the latter the systematic side. Both should find a place on the reference shelves of the nature-study teacher. To the student of aquatic life they are quite indispensable. O. A. J.

Goldfish Varieties and Tropical Aquarium Fishes by Wm. T. Innes—Innes & Sons, Philadelphia. 80, 246 pp. Illustrated.

While this is a book about aquarium fishes, it contains a vast amount of practical information of value to a teacher or to one who has an aquarium of any sort. Such chapter headings as "The Freshwater Aquarium," "Terraria and Aqua-Terraria," "Fish Foods," "The Microscope in Aquarium Work," "Plants for the Aquarium and Pond" indicate sources of much good and useful freshwater biology, while the last three chapters on "The Construction of Aquaria, Tanks, etc.", "Aquarium Appliances," and "Forty Dont's" are exceedingly practical. All are very clear in statement and excellently illustrated. It is a beautiful and helpful book that ought to find a place on the shelves of all good school libraries. J. G. N.

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THE
NATURE-STUDY REVIEW

VOL. 14 MAY, 1918 NO. 5

Rufus, the Red King

ANNA C. STRYKE
Claremont, California.

In these days we are hearing more and more of the part which dogs are taking in rescue work. And what a noble work it is! There is a Dog Hero whose story I must tell because, although he has done no rescuing in the war zone, his career merits as much praise as that of any of the Red Cross dogs. Indeed, until within the past year or two, I doubt whether there was another dog anywhere with so many human lives to his credit, unless it be the St. Bernards of the Alps.

For six months of last year it was my privilege to be his companion. How I wish that you might have shared my pleasure. You would have loved him, as I did, from the moment when his paw met my hand in formal acknowledgment of his master's introduction. As is usual with presentations, I was not quite sure of his name. Upon asking him to reassure me he answered, with a two-syllable bark, that his name was "Rufus", just as his master had said. The friendship thus established continued until I was obliged to take leave of him when I left Pasadena, which is his home. I hope, however, to see him many times before we leave California.

His master insisted that he is "just dog", by which, of course, he meant that he is the very finest dog in the world. I learned afterwards that he is a Siberian bloodhound. If you never have seen this kind of dog I can help you only by describing Rufus, for he is the only Siberian bloodhound that I ever knew. He wears a thick coat of burnished red, showing, in front, an expanse of white vest. He has the nose of an English bloodhound, making him keen on the scent, while his "facial expression" reflects all the intelligence and lovable disposition of the St. Bernard. This is his story and that of his master.

In the southwestern part of our country there is a great stretch of arid land, of which most of us know little except that it is called the Great American Desert or the "American Sahara". There are over two hundred thousand square miles of this sunshine, drought, shifting sand, and purple mist, all of it immensely rich in minerals, alkali products, marbles, and semi-precious stones. Small wonder that men are lured into the heart of it! Though it is crossed here and there by railroads and much of it is quite well-known and well-traveled, on the other hand there are great unknown out-of-the-way stretches (for instance, the California Death Valley, that most arid of all spots, yet beautiful beyond all powers of description) which are rich in every variety of wealth except the mainstay of life in these desert wastes—water. It is with these especially dangerous places that our story deals.

The terrors of this country are many. Once in it, there are hardships always to endure—the merciless blistering sun, suffocating blinding sandstorms, the ever present menace of "side-winders" and other poisonous things, the danger of drinkng poisoned water or of having none at all, for of water there is little. What there is is scattered in wells or "tanks" from thirty-five to fifty miles apart. Much of this scanty supply is unfit for use—poisoned by saturation with strong alkali or contaminated by snakes, lizards, kangaroo-mice or coyotes which may have fallen into it. Many a thirst-crazed man has reached such a water-hole only to die from drinking from it. It was after many years of coming upon grim evidences of suffering and particularly after a terrible experience of being without water for three days and two nights and then being rescued by his own dog that Lou Wescott Beck, prospector and mining engineer, dedicated himself and his dog to the work of rescue which has won for him the name of "The Good Samaritan of Death Valley". For sixteen years he spent many months of the year prospecting in this "Land that God Forgot", but always turning aside to give aid wherever and whenever it was needed. The later years of his life were devoted entirely to rescue work, the fascination of prospecting having lost itself in the more humanitarian interest. Each spring found the master and his chosen companion wandering into the silent places to direct travellers, alleviate suffering and rescue the dying. This is how it happens that my Dog Hero has a record of having saved thirty-two men who were in the last stages

of desert delirium; and, as if that were not enough, there are records of three hundred and thirty-four men, lost, out of provisions, without water, and doomed to the terrible desert death, who were revived with water and food carried to them by Rufus; later they were located by his master and taken to his camp where they were fitted out with the things necessary to proceed on their journey.

On these expeditions Rufus wore high laced elkskin boots to protect his feet from the blistering sand. Sometimes too he wore "goggles". Strapped across his back were the saddle-bags containing dog biscuit for his own sustenance, a little food for rescue work, two canteens holding about six quarts of water, and, fastened to his breast strap, a small case bearing the mark of the Red Cross. In it were restoratives, a hypodermic needle and other "First Aid" articles.

I wish that I might picture such a rescue as Mr. Beck recounted. Much of the picture would, I fear, be too horrible. I must leave it to your imagination, which I assure you can serve you but poorly. Picture then man and dog, alone on some barren rocky prominence, looking out over limitless stretches of parched desolate waste. All about them is a deathlike stillness. From out of nowhere there comes a black speck, looming larger and larger against the blazing sky. The speck becomes a bird—large, black and ugly. With a precision born of purpose it flies to a definite spot on the sun-baked sand, then rises in circles to a tremendous height, and, without warning, swoops down again to earth. More specks appear, turn into birds, and join their comrades. With impatience they await the coming feast. The sight is a familiar one to the silent companions. At a word from the master Rufus is off in the direction of the flock of buzzards, even as they alight on their prey. The man following, as fast as may be, sees the birds rise, swoop, rise and fly off. The first step in the rescue is accomplished. Perhaps the poor unfortunate may yet be able to avail himself of the aid which the dog brings in in his saddle-bags. If not, then he must wait until the master reaches them. With unseeing eyes, parched and bleeding lips and swollen tongue the man knows nothing until the red sun, slipping down behind the dark buttes, leaves a cool breath in its wake and relief for the three weary ones. Perhaps they were far from their camp when the signs of distress caught

their attention. The victim can not be moved, may perhaps be only half conscious. Rufus is relieved of his load which is placed within reach of the sufferer, then, tying the dog to the still form, in order to keep off the coyotes or the buzzards which might return, the Good Samaritan goes back to camp for supplies or, perhaps, to a mining camp for a stretcher and more aid. Weeks afterwards the stranger has only the scars where the buzzards tore into his flesh to remind him of his experience, but could he ever forget Rufus?

This then was their chosen work and the manner of its accomplishment, with variations in the urgency of the needs. Sometimes it was a barefoot Indian that they found, a victim of that deadliest of American reptiles—the "side-winder", or horned rattle snake. Perhaps it was not too late to administer an antidote with the hypodermic needle. Always there was someone who needed help.

The rescue work was really divided into two parts, first, that of patrolling the desolate expanse of country and rescuing unfortunate travellers or prospectors from the terrors of the desert death, by administering to their needs, and second, that of erecting signs indicating trails and water-holes, thus preventing suffering. Such signs which, by the way, bore the Boy Scout emblem, for Mr. Beck was a Scout Master, were paid for from the proceeds of the winter lecture tours.

In July, 1917, Lou Wescott Beck passed into the Valley of the Shadow, a victim of his hard life on the desert. His death was probably the indirect result of having taken a few swallows from a contaminated water-hole. He had been without water for thirty-one hours and came upon the "well" at three o'clock in the morning. Knowing that it had been good when he last visited the spot he drank without waiting for Rufus to test it. (Rufus, with his keen scent, was an expert in these matters.) But the dog refused to drink when it was offered to him. Prompt action saved Mr. Beck's life but it was the beginning of a long siege of ill-health, to which he finally succumbed. He left his companion of the past twelve years alone save for Mrs. Beck and the friends which the dog made by reason of his wonderful record. For weeks he was wretched and ill but, though his work is finished, for he could no longer endure desert hardships, even if he had another master, his indomitable spirit and the kindness of those

about him have made him content. When I last saw him, when on a visit to Pasadena, he romped with me like a puppy, but his eyes will never lose that expression of having seen many sad sights and having suffered untold miseries. Yet, I assure you that he can be the jolliest kind of companion, as I learned during the many weeks when we were together.

What would you give to hold such a proud record as that of my Dog Hero, "Rufus, the Red King"?

Unfortunate Mistakes in the Teaching of Nature-Study

EDITH CLARK MAYNARD

Philadelphia, Pa.

May I make an especial appeal to the newly graduated college students who attempt to teach nature-study to children in the lower grades, so often their point of view is wrong? The following incident will illustrate my meaning: A little girl of eight, who has accompanied me on some of my field trips, sat beside me in the car yesterday. Hardly had she settled herself before she began, "Oh Mrs. M———! We had for our nature-study lesson this week a turtle. Miss ——— chloroformed it for us and showed us how, after it was dead, the heart still beat for seven hours. I didn't like it." I never like to criticise another teacher's work, but I could not resist acknowledging that I, too, "did not like it."

Such a lesson speaks for itself. If the young teacher (I infer she is young and fresh from a biological laboratory) had only stopped to think she would have realized her mistake. The beating of the turtle's heart after death is an interesting phenomenon, but its demonstration has no place in a nature-study class room of little children. The killing of the animal was a serious mistake. The sensitive, sympathetic child would suffer, while to others the killing of other animals to see possibly similar results would undoubtedly suggest itself.

Contrast the effect upon children of such a lesson with one which might so easily have been given at this season. Our birds have begun their spring migration. The alders and willows have put out their attractive catkins, while the red maple blossoms can easily be found. If these children had only been allowed to study nature out-of-doors, under normal conditions, not one of them would have made the comment "I do not like it."

The Sweet Brier Rose

MAE CRESSWELL
Cedar Falls, Iowa

IT is a warm balmy afternoon in late May. A brisk shower has just passed over. The sun sends his slanting rays under the dripping foliage of trees and shrubs turning the raindrops that cling to the tips of the leaves into jewels of every hue. Walks are shiny, paths slippery and roads splashy. A soft breeze wafts a rich odor to greet you that cannot be mistaken for any other. It is as characteristic as a mint and belongs to this sort of an afternoon as much as does the many tinted bow now fading in the east. The delightful odor must remain unnamed until you are acquainted with the sweet briar.

"Wild rose, sweet brier, eglantine,
All these pretty names are mine,
And a scent in every leaf is mine,
And a leaf for all is mine,
And the scent—oh that's divine!
Happy sweet and pungent fine,
Pure as dew and pick'd as wine."

—*Leigh Hunt.*

The sweet brier *Rosa rubiginosa* is a native of Europe. Spencer speaks of it, Chaucer mentions it and Shakespeare with his keen perception of the natural world notes its perfume. It was brought to America by our liberty loving forefathers and naturalized beside the doorways of their homes. It went with them on their westward march, a cherished bit of the old home life. From the dooryard it escaped to make beautiful the waste and neglected places. Rich soil and care are not necessary for its happiness. Its sweetness arises from beside the cottage door, beneath my lady's casement window or across the pasture path.

The bush grows several lithe canes that attain a height of five or six feet then curve over as if afraid we would miss them if they grew higher. The canes are usually overlaid with a reddish

tint and quite thickly set with reddish backward pointing thorns. Canes and thorns become brown on the old wood, while on the young growth they are green.

The leaves are pinnately compound, having three to seven leaflets, and somewhat small in comparison with other roses. The margin is finely and doubly serrate. The upper leaf surface is deep green and the lower somewhat paler. The stipules are small and clasping. Thus far these rose leaves appear like any other but the instant they are touched one is conscious of the sweet brier perfume. The under surfaces of the leaves, the calyxes and youngest stems are found to be thickly set with rusty colored hairs. These hairs are the resinous glands which give this rose its characteristic odor. Moisture seems to intensify the perfume. At least it is always richer after a rain or on a dewy morning.

Early June is its flowering time. Clusters of buds with long green calyx lobes twisted over their precious contents appear on the swaying branchlets. The pointed lobes roll back and display a dainty five petaled sea-shell tinted rose about one inch across. For them to be larger would break the symmetry of the rose bush since the leaves are small too. Tradition says they were once white as shown by this verse,—

> "As erst in Eden's blissful bowers
> Young Eve surveyed her countless flowers,
> An opening rose of purest white
> She marked with eye that beamed delight.
> Its leaves she kissed, and straight it drew
> From beauty's lips the vermil hue."

The rose petals are heart shaped on the margin and do not overlap each other. The stamens are many and of a pale yellow hue and the fuzzy stigmas sit in a huddled group in the center. Some have said that this rose flower has no perfume. Be the attraction perfume or tint, honey bees and bumble bees lose no time in visiting it. Sweet brier does not put her nectar down in forbidding wells where only the favored few may sip, but offers it freely to all who wish to partake. Flies and beetles join the buzzing horde around the sweet brier. The rose family usually matures anthers and stigmas at the same time, but the anthers turn outward so the insect visitor touches the stigmas first. Bumble bee tumbles into the rose's slight cup and waddles awkwardly over the

stigmas poking her long tongue among the stamens for the nectar at the base of the petals; honey bee flies in with more grace and selects her place to sip with more care but brings just as surely her contribution of pollen from the last rose visited to rub off on the fuzzy stigmas.

The bees have paid their debts to the rose, and pink petals are no longer of use so off they tumble. The stigmas were only doorways through which the pollen grains went to the tiny seeds inside the calyx. Now the whole business of these seeds is to grow. This they do throughout the summer and by October are hard bony white seeds. The calyx too is changed. It has become an urn-shaped vessel one-half to three-fourths inch in diameter and of a hue to match the autumn. "The scarlet berries tell where bloomed the sweet wild rose" says Whittier. The leaves too assume exquisite tints of crimson and maroon before being swept away by November's gales. But the wind does not take the scarlet rose hips. They remain to remind one of flaming jewels as they swing above the snowclad world. The birds have many a winter feast off the pulpy urns and scatter the seeds afar. Cedar wax-wings seem to get most enjoyment from this dainty treat.

Some classify this rose among the undesirable plants, but one who knew this flower in the home of his childhood can but say with Thomas Warton,—

"Ever after summer shower
When the bright sun's returning power,
With laughing beam has chased the storm,
And cheer'd reviving Nature's form,
By sweet brier hedges bathed in dew,
Let me my wholesome pathe pursue."

The Meadow Lark

"Fine, clear, dazzling morning, the sun an hour high, the air just tart enough. What a stamp in advance my whole day receives from the song of that meadow lark perched on a fence stake twenty rods distant! Two or three liquid-simple notes, repeated at intervals, full of careless happiness and hope. With its peculiar shimmering slow progress and rapid noiseless action of the wings, it flies on a way, lights on another stake, and so on to another, shimmering and singing many minute lights on another stake, and so on to another, shimmering and singing many minutes."—WALT WHITMAN.

An Outline for a Study of the Potato

William Gould Vinal

The Rhode Island Normal School

(The so-called Irish potato, *Solanum tuberosum*, and not the Sweet Potato which belongs to the Morning-glory family.)

I. Historical Facts

For account of origin of the potato, read De Candolle's "Origin of Cultivated Plants," pp. 45–53.

Probably native of Chile, South America. Cultivated by Indians at time of discovery of America. A similar vegetable is eaten by natives of South Africa. Belongs to nightshade family, therefore once thought to be poisonous. First introduced into Europe 1580–1585 by Spaniards. Sir Walter Raleigh introduced "Virginian potatoes" into County Cork, Ireland, about 1584. "Potatoes are of less note than horse-radish,—beets."—Bradley, 1719. "Plant your potatoes in your worst ground."—John Evelyn. Parmentier (1737–1813) a noted chemist, popularized it in France. Potato soup is known as "potage Parmentier" in his honor. Probably introduced into the United States toward end of 16th century (Virginia and North Carolina)

Frederick the Great succeeded in introducing it into Prussia.

Louis XVI and Queen Elizabeth wore potato blossoms to help popularize it. Grown in European flower gardens in 17th century. Called Irish potato because used so generally in Ireland. Potato blight caused famine in Ireland in 1846.

II. Nature Lesson

A. *Subject Matter for Teacher*. An ordinary stem, as a geranium, has buds and leaves. A potato is also a stem. The projections in each "eye" are buds and near the center of the "eye-brow" may be found a tiny scale which is an undeveloped leaf. This rudimentary leaf is seen best in new potatoes. One could imagine a branch of a geranium converted into a potato by reducing the leaves and storing a great deal of starch in the stem. If this modified geranium was then placed underground it would give up its green color due to the absence of sunlight. The stem of the potato is large on account of its vast amount of stored food and the leaves have degenerated because the stem is underground.

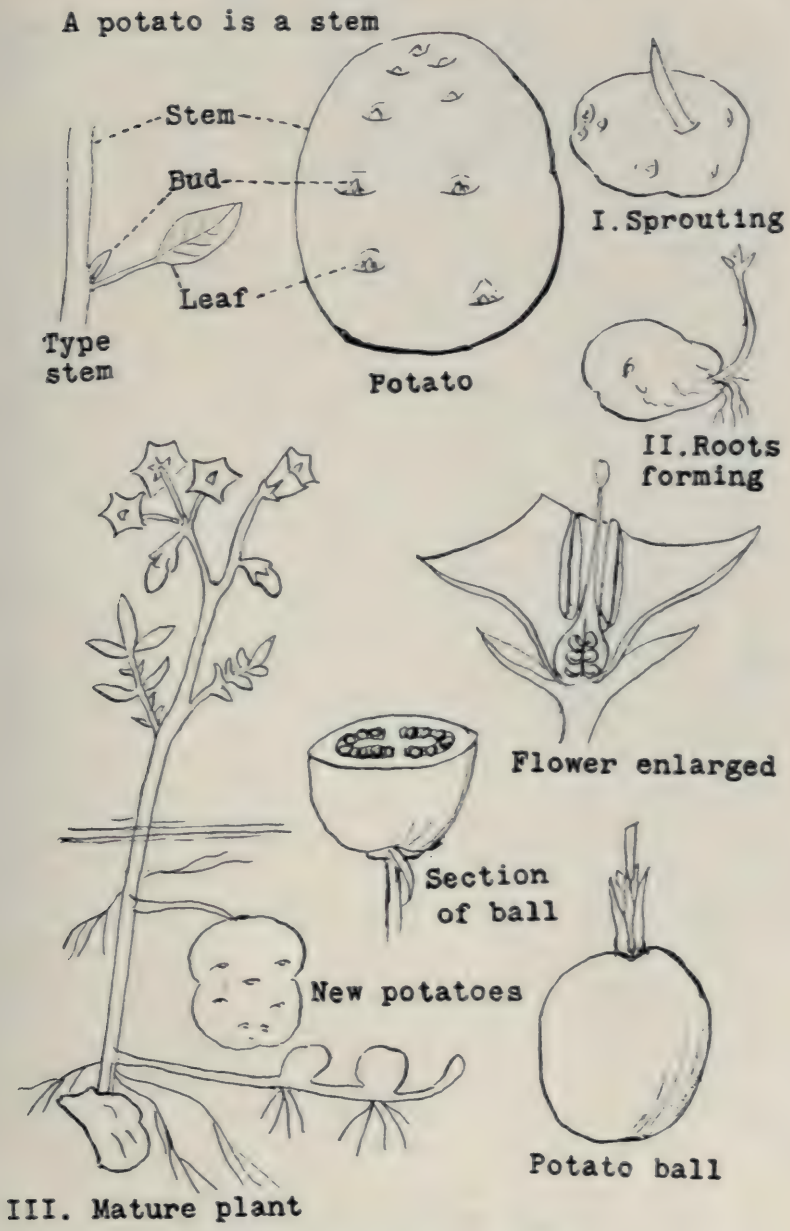
In early spring, the "seed potatoes" are cut into pieces, each piece having an eye. These are planted in furrows and covered with soil. The bud soon sends out a sprout and from the base of this stem appear small roots. The sprout grows above ground and sends out ash-shaped leaves. The soil is usually drawn around the young plants with a hoe and this forms the "hill". This practice is not good as it drains moisture away from the potato. The leaves take carbon dioxide from the air; water and mineral substances from the soil by means of the roots; and, in the presence of sunlight, warmth and leaf-green, manufacture a liquid nourishment. In the meantime, underground branches have started from the base of the sprout which look very much like the roots but are slightly larger. These underground branches receive the sweetish food, which is manufactured by the leaves, and begin to enlarge at their ends into potatoes. The food is stored in the potato in the form of starch.

The blossoms do not usually produce fruit. This is because it has not depended upon seed but has been reproduced by man in the way just described. In colonial days, the "seed-balls" or "potato-balls" were quite abundant. After the blossoms fall off, the plant above the ground withers and dies. The potatoes are now said to be "ripe" and are dug with a hoe or potato digger. On large, level farms the potatoes are dug by machines. When the potatoes are harvested they are stored in bins in the cellar or in a dark room where it is warm enough not to freeze the buds, and cold and dark enough to keep the sprouts from starting. In the spring, sprouts start from the eye of some of the potatoes. The sprouts grow very rapidly, taking the nourishment out of the potato until it becomes wrinkled and unfit to eat.

B. *Method of Procedure.* Aim: Appreciation of common things and how plants reproduce. Preparation for intelligent and appreciative interest in potato growing in the spring.

Have pupils plant potatoes in a box containing sandy soil. Keep warm and moist. Watch how they grow. Take one up at different intervals to show changes. Draw different stages. Describe the changes. Keep a diary. Review parts of a typical stem using geranium as example. Have someone draw geranium on board to show stem, leaf, and buds.

Lead pupils to find some parts in a potato. Make drawing of potato beside sketch of geranium. Connect same parts with



A Portion of Chart for Study of the Potato

dotted lines. Lead class to infer that the potato is a stem. Have pupils reason out: Why leaf is reduced? Show class a potato which has been exposed to sunlight and one that has been in the dark. How account for difference in color? Conclusion: The potato is an enlarged underground stem.

Apply a weak solution of iodine to the cut surface of a potato. Observe results. Iodine colors starch blue. Infer that starch has been stored in the potato or underground stem.

About a month before this lesson remove the skin from a potato and weigh. Leave in a warm place. Pupils now observe changes in size and weight. Lead class to infer that its loss in size and weight is due to evaporation of water. The composition of potato is 78.3 per cent water, 18 per cent starch, 2.2 per cent protein, 1.0 per cent ash, and 0.1 per cent fat. Show by diagram about how much of a potato is water and how much starch.

Show class a potato which has sprouts upon it. How does it differ from a potato without sprouts? (Wrinkled). Why? New growth eating the starch which was stored in it. Infer that starch is stored in the potato as nourishment for new plants. Note that sprouts are long white stems with small white leaves. Why white? Why long stems? Why small leaves? Leave specimen exposed to light and observe changes. Why are potatoes with sprouts not desirable for the table?

Pupil dig up a piece of potato which has been planted. From what does the sprout start? From what do the roots come? Do the shoots or roots start first? In what direction do the roots go? Why? Why should the earth be kept loose about the growing plants?

Teach class why potato has large leaves above ground. Show flowers. Show "seed-balls". These should be collected the year before and preserved in formalin in a small bottle. Explain law of disuse. When the potatoes are ripe the parts above ground wither and die. Why? (They have served their function.)

If possible show a potato plant with the new potatoes. Have class review by giving life history of this plant. A diagram may be substituted if the plant is not available.

III. Potato Gardening

A. *Organizing Club.* Send to the U. S. Department of Agriculture and to the State Agricultural College for all literature related to the Potato Club Work.

Farmers' Bulletins 35, 91, 295, 324, 386, 407 and 410 and Bureau of Plant Industry Circular No. 113 are especially valuable.

Let pupils take home cards showing requirements for potato club work. Obtain permission of parents for children to join the club and so far as possible for land. The "landless" children should be given opportunities in the school garden, in window-box gardening, and in experimental work.

B. *Steps in Gardening.* Select an open unshaded area. Rich sandy loam is best. Drive a stake in four corners of proposed garden and connect with string. Spade up garden for depth of eight inches. Rake until surface is fine and level. Fertilize with street sweepings or buy fertilizer from a seed store. Mix well with soil. Select a well known variety that grows best in the neighborhood. Throw out any diseased potatoes. Mix one-half pint of formalin to 15 gallons of water. Put potatoes in solution for two hours and then dry them. This prevents scab disease. Cut potatoes lengthwise into quarters, each piece having two or three eyes. Plant four inches deep and about a foot apart in rows. The rows should be a foot apart unless it is possible to cultivate with a horse and harrow. Hoe once a week to keep top soil fine and to prevent weeds. Keep this up until the plants shade the whole ground. Spray with Paris green as soon as the potato-beetle is seen. Add Bordeaux Mixture when plants are eight inches high to prevent disease. Mix one-fourth pound Paris green, one-half pound lime to 25 gallons of water. Dig potatoes as soon as tops are dead. Keep potatoes from each plant separate Do not allow them to be exposed to the light. The best hills have a large number of potatoes which are uniform in size. Select seed potatoes from these hills for the next season. Separate the remaining potatoes into marketable potatoes and culls. The culls include all small and injured potatoes. Sell or store in a dark place.

C. *Suggestive Records for Booklet.*

Name.....Street and number.....
Date.....Grade .....
Size of garden .....feet by.....feet.
Description of soil:
Calendar: Prepared soil.....; planted.....; sprouts appeared above ground.....; first flower.....; matured (tops died).....; harvested.....

Accounts

Expense			Date	Income	
				Amount sold or used	Market price per bus.
Cost of seed					
Cost of fertilizer					
Preparation of garden, hours at 10 cents					
Planting potatoes, hrs. at 10 cents					
Cultivation .....at 10 cents					
Date *Hours*					
Spraying mixtures					
Spraying at 10 cents					
Date *Kinds of Spray* *Hours*					
Harvesting, hrs. at 10c				Amount on hand	
Rent of land					
Total cost					Value of crop

D. *Other Garden Facts.* In 1889 there were 889 varieties. New varieties are obtained from seed. Some varieties never produce fruit; others do not even blossom.

Two crops are grown in one year on the same land in the South.

1900–1910. The average acre yield in United States was less than 93 bushels.

1900–1910. Average acre yield in Germany and Great Britain 200 bushels.

E. H. Grubb, "Potato King" of Colorado, produces 600 bushels per acre. Earl of Roseberry, Potato wizard of Scotland, 2000 bushels per acre. Germany yields one-fourth of the world's crop. We consume 3½ bushels per person a year in the United States. We import about one-fourth of potatoes used in United States. There is no garden crop for which spraying is so necessary as for the potato crop.

The best potatoes are about 12 ounces, somewhat cylindrical, shallow-eyed, and white in color.

E. *Pictures.* Collect pictures as well as specimens to show varieties, diseases, different characteristics, machinery for cultivation, and methods of caring for the crop. These may be arranged in the booklets. Obtain Millet's "The Angelus", "The Potato Gatherers", and "Going to Work".

IV. Uses of the Potato

A. *In the Home.* The potato stands next to wheat as an important food crop in the western countries.

Potato Starch. The making of starch is both valuable and interesting. Grate potatoes into a dish of water. The starch granules settle on the bottom of the dish. Keep rinsing with water until the starch is white and clean. Send for Recipes for the use of the Potatoes and Home-made Potato Starch, Form O-7, to the States Relations Service, U. S. Department of Agriculture.

Boiled Potatoes. Most economical to boil in jackets. If pared, place in cold water to prevent coloring. If of uniform size they are done at the same time. Place in hot water instead of cold—will not be soggy. Salt added to water makes the potatoes more tasty. Drain off water.

Baked Potatoes. More wholesome than boiled potatoes. Place in a hot oven until soft. Break skin to let out the steam.

B. *Commercial Uses.* Denatured alcohol; sizing for paper; thickening colors in calico printing; glucose.

V. The Potato-Beetle

Aim: To know the life history and means of protection of the potato-beetle in order to exterminate it. Teach when needed.

Place the larvae of the potato-beetle on a potted potato plant which may be kept in a breeding cage.

In what way are the larvae injurious to the plant? How might we attack the insect in this stage? Handle the larvae and note the odor left on the hands. Would birds enjoy eating the larvae? Why? (A distasteful secretion protects them from birds). Of what advantage are the bright colors of the larvae to itself? (A warning to birds). The larvae change into the pupal stage beneath the ground. How would fall plowing help destroy this pest? In what way would rotation of crops help this problem?

Study the adult. Feed the insect on raw potato. Note whether the adult has sucking or biting mouth parts. (Biting mouth parts). Does the adult or the young larva have the greatest appetite? Compare the size of the legs with those of the ground beetle? (Smaller). What does this indicate? (Depends more on wings for locomotion). In what way does this suggest the need of co-operation amongst farmers of a neighborhood? (If each one does not kill these pests they will soon infect clean areas).

Describe the feet. (Claws and pads). Use? (Crawling and clinging). How many pairs of wings does this insect have? (Two). Note which wings are used in flying? (Inner). In what way are they adapted for flying? (Light and gauzy). Describe the outer wings. (Hard and shell-like). What do you infer is their use? (Protection to delicate under-wings). Pick up a beetle and note how it "plays possum." When one brushes against a potato plant the adult insects drop to the ground and "play possum". What is the advantage of this habit? Hold the insect rather firmly. What is another method of protection? (Acrid secretion).

The orange colored eggs are laid on the underside of the leaves. Advantage?

The potato-beetle was a native of Colorado where it lived on a wild plant of the nightshade family.

VI. Conservation of Moisture

This lesson should precede the cultivation of the potato crop. Experiment 1. Devise a rack to hold four lamp chimneys in a vertical position. Tie a piece of cloth over the bottom of each and fill within three inches of the top with gravel, sand, clay, and loam, respectively. Pour the same amount of water into each chimney and note the time it takes each soil to absorb the water. Which allows the water to pass through most quickly? Which soil should we add to a garden that loses its moisture too rapidly? What soil should we mix with garden soil that does not absorb water readily? The force which causes the moisture to go downward is called gravity. In heavy soils plant potatoes about three inches deep and in light loose soil four to five inches deep. Why?

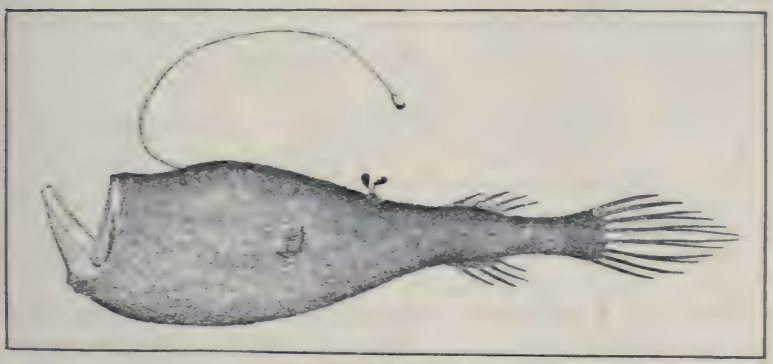
Experiment 2. Pack the soils in the lamp chimneys rather firmly and add a loose dry layer of the same kind of soil on top. Let the lower ends of the chimneys in a pan of water. Note the rate at which the water passes upward in each soil. Compare the rate at which the moisture passes upward in the packed soil and in the loose surface soil. This upward movement of the water is due to capillary attraction. Which would you expect to be more important for the plant, gravitational water or capillary water? This experiment shows how tillage will conserve capillary water. Explain. The surface layer is called a mulch

and this practice is known as dry farming in the west. If it were not for saving of the moisture they could not farm in dry regions.

Experiment 3. Place soil in a tray. Pack the surface firmly on one side and leave a loose surface on the other. Incline the tray slightly and pour water on gently from a watering pot. In which case does the water soak in and in which case does it run off the soil? Lead class to infer that a second reason for keeping a mulch is to absorb the rainfall.

The sun bakes the soil after a rain forming a hard surface. What effect would this have on evaporation of the water? (Hastens). What would be the relation of such a surface to the next rainfall? (Water would run off and not soak in). Give two reasons for hoeing the garden after a rain. Tillage to conserve soil moisture is really more important than tillage to kill weeds.

Experiment 4. Place the same weight of wet sand in two trays of the same size. Arrange soil in one so that it is made up of parallel ridges and keep the contents of the other tray flat. These two trays illustrate two methods of cultivating potatoes, one is called the ridged system or "hilling-up" potatoes and the other is known as the flat method. Weigh occasionally to see which is losing the moisture more rapidly. (The flat method exposes less surface soil and therefore conserves the moisture.) Should we "hill-up" potatoes or use the flat method in a dry region? In a region which has a great deal of rainfall?



The Blind Angler

The picture shows this amazing fish right-side up and we beg its and Dr. Schufeldt's pardon that we after much deliberation displayed it wrong side up in the April number of THE NATURE-STUDY REVIEW.

Viscount Bryce on Nature-Study

M. A. Bigelow
Teachers College, Columbia University

My attention has been called to a strong statement in favor of nature-study in an article on the "Worth of Ancient Literature to the Modern World," which Viscount Bryce wrote for *The Fortnightly Review*, of April, 1917 and which has now been reprinted by the General Education Board. I quote as follows:

"What sorts of capacities and of attainments go to make a truly educated man, with keen and flexible faculties, ample stores of knowledge, and the power of drawing pleasure from the exercise of his faculties in turning to account the knowledge he has accumulated? How should the mental training fitted to produce such capacities begin?

"First of all by teaching him how to observe and by making him enjoy the habit of observation. The attention of the child should from the earliest years be directed to external nature. His observation should be alert, and it should be exact.

"Along with this he should learn how to use language, to know the precise differences between the meanings of various words apparently similar, to be able to convey accurately what he wishes to say. This goes with the habit of observation, which can be made exact only by the use in description of exact terms. In training the child to observe constantly and accurately and to use language precisely, two things are being given which are the foundation of mental vigor—curiosity, i.e., the desire to know—and the habit of thinking. And in knowing how to use words one begins to learn—it is among the most important parts of knowledge—how to be the master and not the slave of words. The difference between the dull child and the intelligent child appears from very early years in the power of seeing and the power of describing: and that which at twelve years of age seems to be dullness is often due merely to neglect. The child has not been encouraged to observe or to describe or to reflect.

"Once the Love of Knowledge and the enjoyment in exercising the mind have been formed, the first and most critical stage in education has been successfully passed. What remains is to supply the mind with knowledge, while further developing the desire to acquire more knowledge."

It is obvious that Viscount Bryce's reference to observation directed to external nature means what here in America we call nature-study. It is also interesting to note that he believes that such observations "should be alert and be exact." It has often been lamented by leading educators that much of our nature-study has failed in these two requirements. It is also interesting to note that Mr. Bryce would have the child learn to use language along with observation, and that observations should be described in exact terms. This is exactly along the line that some of our leading nature-study workers have always advocated as a correlation between nature-study and language work. In short it seems to me that the two paragraphs quoted are very suggestive of how nature-study should be conducted so as to develop the habit of observation, description, and reflection concerning the common things of nature.

'Twas at Christening Time

HOPE H. GIRARD

ALL flowers were in bloom; wherever they could grow, they grew.

The world-garden was full of sweet fragrance and splendor, because it was the fulness of Time. The sun shone, and birds sang, sang, sang!

As the wonderful, lone Gardener passed in and out among them, to name them, he tenderly touched a petal, a stem, a leaf, even a stalk as they turned their beautiful heads toward the light that he might better see them.

Some were tall and stately, and held their heads fittingly high; some stooped and blushed almost unseen, but the great Artist found them; some clung or leaned and modestly showed their colors and delicate lineaments; some in mellow hues or strong tints stayed just mid-way and laughed because they were alive and could help to make the world lovely, and everybody happy; and their Friend smiled with them for joy; still others grew gracefully and luxuriantly on the ground, weaving and interweaving a soft carpet for His feet.

Oh, it was a gorgeous sight, a great rejoicing, a glorious naming! All the world was a-stir at this baptismal. Rare was the look on the Master's face.

The rose, the daisy, the blue-bell, the pansy; the buttercup, the lily, and the others were named. The Gardener still moving noiselessly in and out among them, always recognizing each in its exquisite life time glory, was about to turn away, when he heard a timid little voice, that came from the brink of a brooklet, say "Forget me not; I have no name." And as the great Teacher looked down over the edge of the bank, he saw growing in among some soft moss and grasses, a lovely little light blue flower, reaching out over the rock to the Light. As He stooped to touch it, he said: "It shall be Forget-me-not. Your name is 'Forget-me not'"—and the little flow'ret reached up higher and said: "Thank you, and I will forget *Thee* not."

The gentle breeze that flitted everywhere, everywhere, caressing the Master, lightly fluttering his robe and kissing the cheeks of the blossoms, said that it heard each flower in the garden say, as it nodded its pretty head, "I will forget Thee not! I will forget *Thee* not, Christ-man!"

And to this day, the true forget-me-not plant chooses the banks of streamlets, or moist shady places where to grow and send into the world its beautiful little forget-me-not blue flow'rets.

When to the flowers—so beautiful
The Father gave a name,
Back came a little blue-eyed one
(All timidly it came)
And standing at the Father's feet,
And gazing in His face—
It said in low and trembling tones,
With sweet and gentle grace,
"Dear God, the name Thou gavest me
Alas! I have forgot."
Then kindly looked the Father down
And said, "Forget-me-not."

Author unknown.

The Blue Violet

ADENA K. BURT
Lake George, N. Y.

"Here she is again, the dear,
Sweetest vestal of the year,
In her little purple hood,
Brightening the lonesome wood.

We who something worn with care,
Take the road, find unaware
Joy that heartens, hope that thrills."
—*Margaret Sangster.*

All through the ages our ancestors have rejoiced at the appearance of this little blue hooded dainty, and who of us now has not had his heart gladdened at some time or another by a glimpse of some fresh green nook in early May where—

"purple violets lurk,
With all the lovely children of the shade?"

"Ion" is the Greek name for the violet and is reputed to have been bestowed on it because, when Jupiter had metamorphosed Io into a white heifer, he caused sweet violets to spring from the earth in order to present her with herbage worthy of her.

Some etymologists trace the Greek name Ion to Ia, the daughter of Midas, who was betrothed to Atys and transformed by Diana into a violet to conceal her from Phoebus. Along with other flowers the violet was assigned by the ancients to Venus. It is said that Proserpine was gathering violets as well as narcissus when she was seized by Pluto. The Athenians more especially affected the violet; everywhere throughout the city of Athens they set up engraven tablets with the name and preferred for themselves above all other names that of "Athens crowned with Violets."

The blue violet has been and surely is the best-beloved as well as the best known of our early wild flowers, and it seems as if no other flower were so suggestive of the dawning year, so associated with the days when life is full of promise. Its message is always the same, "Spring is here" and our winter worries and regrets become like May violets which bud and blossom like the rest.

It is at this time of year in which we seem to have a desire for something more than common gain.

The Common Blue Violet Growing in a Pasture
Photo by Verne Morton

Although I believe that more than a hundred species of violets have been recorded, only about thirty are found in our country; of these perhaps twenty are native and flourish in the Northeastern states. Unfortunately we have no strongly sweet-scented species, none

> ". . . sweeter than the lids of Juno's eyes
> Or Cytherea's breath, . . ."

as Shakespeare found the English blossom.

Our own very dear, *Viola palmata* which refers to the shape of the leaf, palmate leaved or lobed, variety *cucullata*, the common blue violet, is a humble bit of color which does not disdain to brighten up our dooryards or pastures; it likes human company, but is also familiar on roadsides, woods, meadows and in fields, far away from the sound of man covering hollows and hillocks in such purple crowds that:

"One might guess,
A storm of blossoms had fallen there,
And covered the ground with sweet excess."

But we will always find the finer forms of this little flower in cool, shady dells, where the moss clings on the stones and the water trickles over the rocks; here each little flower will be,—

"Fair as a star, when only one
is shining in the sky."

The blue violet doesn't seek gaudy rose bowers or gardens to show its beauty, it is perfectly content by the poorest homes arrayed in modest tints. I think it could teach us all a lesson in humility.

The flower is distributed from Maine to Georgia in the east and extends westward to Minnesota and Arkansas.

The violet grows about twelve inches high, it has a fleshy, thickened rootstock which begins its work before the snow goes off the ground, and if we were to uncover the ground from its leaves and snow in March, we should find the violet leaves well on their way. The profusion of blossoms however, comes in April and May. This fleshy rootstock stores food all during the summer, so in the early spring the plant does not have to make a supply of food, but can put forth leaves and flowers to get the sunlight before many of the other plants around it, have thought about waking up. When the complete summer foliage is out the violet might have no chance whatever with the sunlight.

The leaves and flowers are borne on stalks which all appear to rise from the ground or from rootstocks creeping along the ground, thus it is known as the stemless species. The first leaves are likely to be heart shaped with the sides rolled inward resembling those of Meadow violet, but the later ones have margins divided into many lobes; they are radical and long petioled with a broad sinus.

The irregular flowers of *Viola palmata* are borne solitarily on a single scape, in color they are deep or a pale violet blue rarely ever white,

"I know blue modest violets,
Gleaming with dew at morn—
I know the place you came from,
And the way that you were born!

When God cut holes in heaven,
The holes the stars look through
He let the scraps fall down to earth,—
The little scraps are you."

And who of us that have seen a patch of these flowers can doubt this origin? There are five, green sepals extended into ears at the base, the blue petals are of the same number, with one pair above, another pair, one at each side, and a broad, lower petal. This species is called a bearded species which means it has a fringe of hairs on the inside of the petals toward the base. These beards on the spurred, lower petal and the two side petals give the bees a foothold when they turn head downward, as some must, to seek nectar and also forms an arch over the door of a throat leading to the nectary. This downward attitude of the bees enables them to receive pollen which is dusted on their abdomens when they jar the flower at a point nearest their pollen collecting hairs. The fringe is very useful too, in brushing off new pollen from visitors.

The nectary is situated in the spur which is formed by the lower petal projecting backwards; in order to reach the treasure which is at the rearmost point—the insect must thrust it's tongue through a little door guarded by five anthers and a pistil. The insect thus becomes laden with pollen and carries it from flower to flower.

Possibly more than one observer has noted how abundant may be the blue blossoms, "they may fairly carpet the earth," but there is no corresponding production of seed. When one comes to think of it there are never very many seeds on the Blue Violet, for it appears that this profusion of blue blossoms is largely for show and not for use, and that when the plant really wants to mature some seeds, it puts forth half buried under the leaves and grass and next to the ground some whitish flowers which never open nor develop petals, but are fertilized in the bud and are exceedingly fruitful. These peculiar, whitish buds are on curved peduncles an inch long. A dissection of one of these buds reveals a miniature flower, furnished with a good stigma and well developed anthers. These are produced throughout the entire summer and are called cleistogamous flowers, meaning fertilized in the bud. Here is no expensive glitter of petals, no unnecessary pollen to be wasted by improvident insects.

Dame Nature has evidently constructed these flowers after the strictest economy. It is with seeds made in this way that our blue violet maintains herself in so many lands and despite great hardships. The little seed pods are three lobed, each one of these lobes dividing lengthwise with a double row of seeds within. To scatter the seeds each lobe curls back and expels her load.

There are many different species of violets all belonging to the same family Viola, and they frequent quite different locations, short stemmed, long stemmed and sweet odored, all variations and kinds. We would hardly recognize the blue violet's yellow and white sisters as even being members of the same family except for their general shape and parts. The long spurred violet is very interesting, with faint, lavender colored petals which are finely marked with dark, hair-like lines showing the bees where the precious nectar is hidden.

Every spring when I was a little girl I looked forward with anticipation to a trip in my grandmother's orchard on the farm where I could gather violets. These were the first flowers I came to know and my heart was broken if this annual spring trip was prevented. I always took large bunches home and had lots of fun fixing them in bowls of water. The next day at school we played "rooster" and often would be made to stay after school. I hardly think our teacher could have heard of nature-study.

In the winter one of our florist's choicest and most expensive bouquets is of violets; and whose face doesn't beam when they open a purple, square looking hat box and find a bunch of these precious flowers, whether one is old or young! The florist sometimes places in the middle of this bouquet a tea rose or two, but to me this always seemed superfluous—the violet needs no outside adornment.

By ancient writers, the violet is frequently mentioned, and its name came to be applied indiscriminately to all sweet scented blossoms. In eastern countries the violet is still a favorite flower and a sherbet flavored with its blossoms is a common drink.

It is said Mahomet preferred the flower to all others and once remarked, "The excellence of the extract of violets above all other extracts is as the excellence of me above all the rest of the creation: it is cold in summer and hot in winter."

At the floral games instituted at Toulouse in the early part of the fourteenth century, the prize awarded to the author of the best

political composition was a golden violet. The fair founder of these games whilst undergoing a weary imprisonment sent her chosen flower, the violet, to her knight that he might wear the emblem of her constancy and thus the flower became a symbol of faithfulness. It has now come to embody two more virtues those of love and modesty. The violet—"stands first with most, but always with the lover."

The Romans, also were extremely partial to the violet and cultivated it largely in their gardens. A favorite beverage of theirs was a wine made from the flower.

It was formerly believed in England that when violets and roses flourished in autumn, there would be some epidemic in the ensuing year. In Worcestershire, the safety of the farmers' young broods of chickens and ducks is thought to be sadly endangered by anyone taking less than a handful of violets and primroses into his house. Pliny had so high an opinion of the medicinal virtues of the violet as to assert that a garland of violets worn about the head prevented headache or dizziness. However absurd we may think these superstitions in our time, nevertheless we must sympathize with the ancient's use and reverence for the flower.

Not only with the ancients has the violet won distinction, because it is and has always been in high favor with the French, and is now the recognized badge of the Imperial party, having become identified with the Bonapartists during Napoleon the First's exile at Elba. What very interesting tales of the violet ancestors might we know, were we but versed in flower language.

In the time of Charles II, a conserve called "violet-sugar" or "violet-plate" was recommended by physicians to consumptive patients. Even in our own war times it might be well, should we look into food conservation in this way Who knows, but that in a few years "violet sugar" may be a daily sweetmeat.

The violet more than most flowers has impinged upon the imagination of the poets. They have loved them and sung in varied strains of their fragrance and lowliness; however, blue violets will go on living their own lives in their own way, maintaining their modest beauty, quite unmindful of the poets.

"The violet in her greenwood bower,
Where birchen boughs with Hazel mingle,
May boast itself the fairest flower
In glen or copse or forest dingle."

—*Sir Walter Scott.*

Birds in a Florida Jungle

PHYLLIS SUMMERS

Ames, Iowa

With field glasses and bird book I started for the so called "Florida Jungle," which in wild life does not much resemble Kipling's jungle but is just a dense woods with an abundance of undergrowth. I have never seen a wild cat nor even a rattle snake in these woods. but I do not doubt the latter are there and I have even heard of wild cats in Florida. But this jungle is a place where lichen and moss spring up in a night and birds are to be found in their glory.

It was bird hunting that I went on this particular morning. There had been a rumor of a "new bird" about the place—some reports saying that it was strikingly marked with orange—others that the bright color was red. I had had a tantalizing glimpse of the bird myself and was determined to have another view, if possible.

I found a small cleared place and sat down to wait. The first sign of animal life I saw was my study for the morning. The "new bird" came creeping out from under the palmettoes, looked around and, unconcerned by its visitor, began scratching for worms. Almost immediately it was followed by another. They did not seem to notice me until I turned to the "Field Key" in my bird book, and then they both disappeared under the brush but continued to give their call as they rustled the dead leaves about in their search for breakfast. I had gotten a splendid view of the birds but because of my exaltation over the beauty of them as a whole, I had failed to get any specific details. However with the idea of a black head and breast with red sides I began to study my book in hopes of finding a name for our new friend. I had hardly made a beginning when I heard a slight rustle among the branches and looking up I saw a bright yellow bird flitting about the palmettoes. It flew over and lighted on an upright stick which was not more than two feet from me. It was a small bird of the most vivid yellow and across its eye was a streak of jet black. It tipped its head and looked at me as though to say "I'm not afraid of you," and then darted away as quickly as it had come. But another was playing nearby and a cardinal was scolding in a neighboring bush and yes, there came one of

my yet unnamed birds from under the brush again. Though beautiful it was no such flame of color as the cardinal, and what had seemed a bright red before now by contrast faded into almost a brown. It was about the size of the cardinal and similar in shape. As it hurried back under cover it almost ran into a covey of quail which I could barely see through the dense underbrush. A call from a woodpecker made me look up but instead of the woodpecker that had given the warning I saw a large hawk circling overhead. All was quiet until he disappeared in the distance and then almost immediately the birds began to hop in sight and the entertainment began again.

For an hour I watched the actors as they made "their exits and their entrances," never missing their cue and never leaving an empty stage. Overhead the orchestra seemed to put a finishing touch to the scene. When was such music ever heard before! No other than the mocking bird could be "playing" so many tunes. I wanted to get a glimpse of this bird of song, not that I thought this was any camouflage music. No one could have doubted that it was the real thing. However, he stayed well out of sight in the tops of the trees. But the red bird's crest had fallen and he was now singing in jealous rivalry of the unseen songster. A butcher bird at my other side was performing in the air, giving vent to the funniest antics, hovering over the same spot, then darting one way and then the other. Down to the ground he swooped and up again. His wings were going rapidly but he remained in the same spot as though standing in the air—then down again, a slight struggle on the ground and away he flew with a good sized lizard. I thought, "What a meal!" and then realizing it must be dinner time, I left the land of birds and went home wondering if there was ever a more wonderful place than a Florida jungle. That night I named the new comer,—Towhee.

What cheer!
What cheer!
That is the cardinal grosbeak's way,
With his sooty face and his coat so red;
Too shrill, too red, too loud and gay
(Top-knotted like a Jay),
Too crude for the critical eye and ear!
In a wild plum-thicket of Tennessee
He flung a challenge out to me.

—*Maurice Thompson* in "To an English Nightingale."

A good portrait of a bumblebee
Photo by L. Wendell

The Bumblebee and the Garden Flowers

Not the bluebird with his sweet song and the promise of blue skies on his wing is more welcome to my sight in Spring than is the vision of a great queen bumblebee flying low over the faintly green sod prospecting for a site for her summer nest. Around and around she flies, buzzing happily but anxiously stopping now and then to explore some likely opening only to reject it and go on house-hunting. It is certainly hard times when a queen has to go house-hunting, but she doesn't mind unless perchance she meets some foolish ignorant boy who proceeds to hunt her with a stick, not knowing that by so doing he is damaging his own crops, especially his melon, pumpkin, and clover crops. If Fate slaughtered all folks who do foolish things there would have been in the past large casualties among country boys who kill bumblebees.

The big queen is not old if she is big. She was born late last summer and she has had a hard time living through the cold winter in some protected place where she went to sleep like a wise woodchuck, and forgot her troubles until the spring sun warmed her back to life.

What the bumblebee queen usually wants to find is the deserted nest of a field mouse which she will proceed to lease forthwith—since it gives her just the kind of a house she likes. But if she does not find it she will accommodate herself somewhere else. She sometimes takes a rotting fence rail and one year one of our ambitious queens hunted higher and took possession of a tile nest in which we fondly hoped a pair of chickadees would set up house keeping.

After she has found a place to live, she starts straightway to making loaves of bread; a bread that would suit Mr. Hoover because it is made entirely of substitutes. For flour she gathers pollen from the early flowers and for mixing she uses some nectar. It is a sweet bread that she molds into a big irregular loaf. But this bread isn't for her own selfish uses—it is food for the family that is to be. For when she gets a loaf large enough, she lays an egg here and another one there upon it. Then she gathers more pollen, a hard and taxing toil for such a big clumsy bee and makes more sweet bread and upon it lays more eggs.

The youngster that hatches from one of these eggs is a little creamy white bee grub, looking as little like her queen mother as an angleworm looks like an oriole; but she is her mother's true daughter just the same and a knowing one too—for she at once begins eating the bee bread and makes a little cave for herself by eating all that she digs, just as a boy would make a cave in a sponge cake if it were as large as a house. By and by she has eaten her fill and shed her skin several times like all young insects, and has reached her full growth. Then she spins about herself, from her own little spindle which is very near her mouth, the most beautiful and delicate silken blanket that ever covered an insect; and rolled snugly in this she takes a long rest while her legs and wings are growing. After a week or so she sheds her pupa skin and crawls out, a damp but perfect bumblebee. She is not so large as her queen mother and that is well, for she has a special business to accomplish. All the eggs laid by the queen in the spring hatch into daughters, because daughters are needed to help in getting the food and caring for the young bees; the chief work being the gathering of pollen and nectar and making many loaves of bee-bread, because the bumblebee babies can take care of themselves if they only have a loaf of sweet bread to burrow in. After her eldest daughters takes the responsibilities of getting

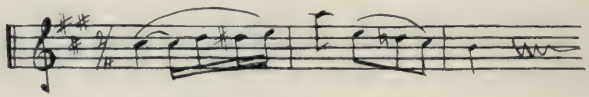
the food, the queen mother does not do any work but devotes her time to laying eggs so that the colony will be large and strong.

Late in the summer two things happen in the bumblebee nest. First, so many bees have made caves in bee bread that the nest is full of these cells each one lined with a silk blanket and the busy bee daughters, feeling in "their bones" or somewhere else that autumn and frosts are coming commence filling these empty bee grub caves with honey and sealing them up with as much satisfaction as a woman cans plums and peaches. The reason the bumblebee comb is so irregular instead of being beautifully six-sided cells like that of the honey bee is that the bumblebee grubs in burrowing into the bee-bread just go "every which way." Who but a bumblebee anyway would think of storing her honey in a grub-cradle!

The other thing of importance that happens is that the eggs which the queen lays late in the season hatch into sons and those daughters whose business it will be to be queens next year. The sons are queer helpless chaps. They are better off than the drones of the honeybee because their tongues are long enough so that they can get nectar from flowers; but they have no stings. Or at least the ones we had experience with as children hadn't any. We knew them, or one species of them, for they had white faces instead of black faces like their sisters; and our bravery in catching one of these fellows in our hands was the wonder of our fellows who knew naught of his droneship's incapacity as a fighter. But these sons are given to making excursions and during some of these journeyings they find some queen of their species for a mate. But though the drones come back to the nest and the honey their sisters have stored there, they and their sisters succumb to the cold of winter and only the queens are strong enough to survive.

The bumblebee is of greater interest to us because of her work in carrying pollen for the flowers in our gardens. It seems as if the flowers await anxiously her coming. Watch her working in the iris, foxglove, lady's slipper, hollyhocks, larkspur, monk's hood, canterbury bells. But especially watch her work in the melon, cucumber and pumpkin blossoms. For there would never be a cucumber or melon orpumpkin for our table if it were not for bees and especially the bumblebees.

When we are in the garden and see bumblebees visiting our flowers, let us note the following things: A bee visits for a period of time the same species of flowers and does not go from one kind to another. If she did, she would not be carrying the right kind of pollen to serve her flower friends. Some flowers she enters back up and some, back down; in either case notice where she becomes dusted with pollen and how her furry covering is fitted for brushing and holding pollen. Then notice the shape and positions of the floral parts and see that the part of her which becomes dusted with pollen comes in contact with the stigma of the next flower she visits. Note where she probes for nectar and how many times in one flower. See her, when she is thoroughly dusted with pollen, stop and clean up by combing out the pollen with her middle legs and packing it in her pollen baskets which are on her hind legs.



A New Spring Song

WILLIAM PRINDLE ALEXANDER

Sing a song of silvery Spring
  Just at winter's going,
Golden forces entering
  And a little snowing,
Ere a sprout has ventured out
  On the Southern stretches,
And the rill, upon the hill
  Its changing picture etches.

Sing a song of willow row
  Decked with catkin furry,
While the drift is still below
  Where swelling streamlets hurry;
When the skies, hint Paradise
  Of coming rapture vernal,
And in his heart man feels a part
  Of all that is eternal!

Sing a song of Marigolds
  Bright as burnished metal,
Treasure that some fairy folds
  In each shining petal;
In the marsh, when winds are harsh
  And fitful rains are sweeping,
They bloom apace, with laughing face
  While violets are sleeping!

Sing a song of Mayflowers
  In the month of sweetness,
Blooming ere the gay flowers
  Mark the years completeness;
Then up! and seek, in woodland bleak
  Their half-celestial cluster,
That might endow, fair Flora's brow
  With wreath of matchless luster.

Sing a song of bluebird
  Herald of the play-time,
When the world anew-stirred
  Revels in the May-time;
Then to be out, and roam about
  The world's wide fairy palace,
For mead and elm is wonder-realm
  Full strange as that of Alice!

Sing a song of buttercup,
  Waving grass and daisy,
Gorgeous wings that flutter up
  Leisurely, and lazy;
Magic dye of butterfly,
  Song of bee and cricket,
With sweet idyll, of birds that trill
  And nest in every thicket.

Sing a song of th' human heart
  Waiting for the healing,
When the sluggish pulse will start
  Anew, with Springtime stealing
In with balm and morning calm
  O'er all the sunless places,
And rapture thrilled, the world is filled
  With joy and sunny faces!

What Became of the Tadpoles?

W. E. Ringle
Manual Training Normal School, Pittsburg, Kansas

This is the sad story of a family of tadpoles—tadpoles that never became frogs. Their curiosity or perhaps it was their appetites, got the better of their discretion.

The writer was the foster father of this family It was a large one, for he and his classes in nature-study had placed about 10,000 frog's eggs in an aquarium in the classroom so the appearance in the world of the funny little creatures might be observed from day to day. They hatched out by the thousands in due time and afforded everybody much amusement. Even several days after hatching they were not much larger than a "wiggle-tail."

It was about this time that the writer, while strolling in Lincoln Park near the Normal, noticed a water plant floating in the creek. It was a bladderwort, a plant found more frequently in the streams of the northern states than in Kansas. He pulled it out and carried it to the classroom, where he placed it in the aquarium that contained the tadpoles. He regarded it as a lucky find, for it would aerate the water and do away with the necessity of changing it frequently.

A peculiarity of the plant was that on its stem, one at the base of each asparagus-like leaf, were unnumbered balloon shaped appendages, not more than one-eighth of an inch in diameter. Into each "balloon" was a small circular opening and this opening was surrounded by bristles. The "balloons" were pea green and semi-transparent.

A few days later some one noticed there were not as many tadpoles in the aquarium as there had been. Their disappearance was a mystery, for it was quite certain no one had removed them. And, what was queerer still, the number of the tadpoles continued to diminish until it looked as though there would be none left.

The Balloons Turned Black

Meanwhile the balloons on the water plant were turning black. This was taken as a sign that they were getting ripe. One was cut open to see what further change accompanied ripening. The knife revealed inside the balloon the disintegrating body of one of the vanished tadpoles. It had become the victim of the bladderwort. Other balloons were cut into and nearly all

proved to contain a tadpole. The plant placed in the aquarium for the benefit of the tadpoles was devouring them.

Examination of the balloons showed that their orifices were large enough to admit the baby tadpoles. As they entered a trapdoor that had stood ajar swung further back to admit them. But once inside, the tadpole was a prisoner without chance of release. Every move made it only served to close the door more tightly. There the tiny creatures remained until lack of air or of food caused their death.

The Common Bladderwort
From "Life of Inland Waters"

A black tadpole within a nearly transparent balloon had caused the appendage itself to appear black. As the tadpole decomposed, its tissues were absorbed by the walls of the balloon to serve as

food for the plant. When the balloon had extracted from the little animal all the nutriment there was to be had, it shriveled up and fell from the stem. It thus served as a coffin for the minute bones of the victim.

Why the tadpoles should have entered the balloons was not wholly clear. They may have expected to find food within. Perhaps the spherical cavities seemed to them to offer a cosy retreat. The bristles around the doors evidently had not deterred them. These bristles appeared to have as their function the warding off of larger animals.

The strange thing, from the point of science, was that the bladderwort should have fed on vertebrates. Dr. C. F. Hodge, the famous naturalist connected with the University of Oregon, was lecturing at the school when the incident occurred. After verifying all the details, he stated that it seemed to add a fact to the sum total of knowledge regarding plants that feed on animals. In all his years of study and research, he said, he had never found or heard of a plant that would make vertebrates its food.

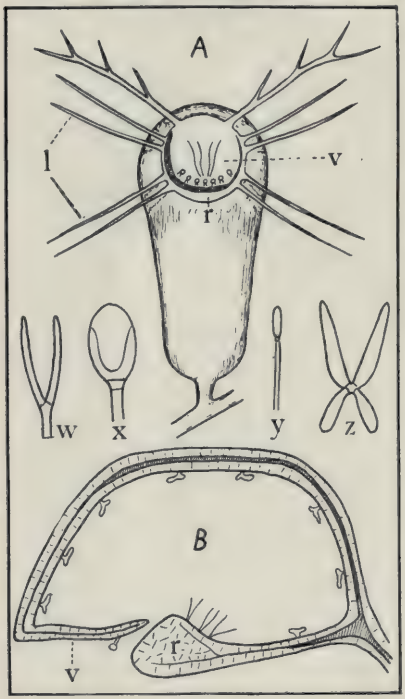


Diagram of Traps of Bladderwort

From "Life of Inland Waters"

A.—A bladder seen from lower side. B.—A section of a bladder showing valve at v; x y z, epidermal hairs

Why not Mosquito Catcher?

There are about 500 species of plants that capture and devour animals, generally in a in a manner more or less similar to that here described. But these animals are, for the most parts insects. The carnivorous plants are therefore generally known as "insectivorous plants." Their other prey are nearly microscopic crustaceans of various kinds, such as the cyclops and daphnia. Among the better known insectivorous plants are the sundew, the pitcher plant, and Venus' fly-trap.

It would seem that the bladderwort (utricularia) might offer a means for combating the mosquito. Why should it not attract and devour the larva of the mosquito just as it does the tadpole? If it does, one way of ridding a community of mosquitoes, it appears, would be to propagate the bladderwort in its streams and pools.

The bladderwort does not withstand the frozen waters of winter. But, through a curious series of events, enough of the plant survives to give rise to new plants the following spring. At the approach of cold weather the leaves on the ends of the stems enlarge to form spherical buds. The other leaves and the stems die. Water then replaces the air that had filled the cavities of the plant and buoyed it up. It sinks in and in doing so draws the "winter buds," as they are called, to the warmer water at the bottom. When spring comes, these buds elongate, break loose from the dead stem, and rise to near the surface. There they quickly put out two rows of lateral branches, on which the balloons soon develop, and the new plants begin to feed in their turn on the tiny water animals that swarm on the sunny surface.

Bird Projects With Outline Drawings

C. H. ROBISON

Montclair (N. J.) State Normal School

(A number of inquiries have been received as to methods of using the separate plates of the Comstock bird note-books. The following article describes the plan used in one normal school with the students fitting themselves for teaching.—ED.)

In our normal school, the "bird book" is one of a list of some 25 or 30 projects, from which students in the nature-study department are expected to choose a number to be completed. This number is variable, the better the work the fewer projects required for the specified total of points. Each project is graded from six up to ten points. An attempt is made to equalize the requirements so that, on an average, each project will make about the same demands on the student's time.

Students usually combine the making of the bird book with work in the manual arts department. Sometimes it furnishes the motive for cover designing; again instruction in various kinds

of stitching and binding grow out of the needs for the bird book. Sometimes the nature-study department furnishes the paper, sometimes the students are thrown on their own resources. This year we are giving out "mist gray" paper for mounting and "steel gray" heavier material for the covers.

The loose Comstock plates are colored and mounted by any one of several methods. Both crayons and water-colors are used, although the general testimony of the students is that better results are obtained in less time with the water-colors. As a guide to coloring, we recommend the specimens in our museum cases and colored pictures. In the latter case the warning is given to compare the colors of the picture with those of the specimens. Many of our students use the A. W. Mumford pictures, 536 South Clark street, Chicago, or the leaflets of the National Association of Audubon Societies, 1974 Broadway, New York. The former cost two cents and the latter three cents. Students are directed to look up and write out the data on a small number of items, as, family (common name of), time of arrival (in the case of migrants), food and economic importance, song, place and nature of nest, other points worthy of note or of interest to children. We avoid stressing eggs as suggestive of undesirable inquiries in the field and we pay little attention to range because of its lack of relation to local study. Students are urged to include appropriate poems and any printed matter, as clippings, Aubudon leaflets, etc We have sometimes required or suggested a color sketch of the nest, either from one of our specimens or from such a source as Dugmore's Bird Homes.

Data from a large number of our normal school students show that each plate requires from 15 to 30 minutes to color, averaging not far from 20 minutes Such a "book" as that just described requires from four to eight hours when five birds are taken. Few hours may indicate either talent, speed, or slovenliness. The longer time may be due to pains, mistakes, extra features, and either exhaustive or fruitless library work. If pupils are expected to do only two or three extensive pieces of work, ten birds is a better number. Where the instructor wishes the handwork projects to be more diversified, five birds are all that may be reasonably expected.

In a school with a large number of sections, or for that matter, in any school, it is desirable to have a number of different com-

binations Each combination should be fairly representative of the birds that children commonly see and of the different important types, as (1) thrush, (2) seed eater, (3) purely or largely insect eater, (4) winter resident, (5) miscellaneous. From the loose plates listed as in stock, the following six combinations have been worked out, all of which can be obtained in the Aububon leaflets. By combining 1 and 2, 3 and 4, 5 and 6, we get combinations of ten, each having a woodpecker and a member of the starling family. By substituting the phoebe, recently added to the Audubon list, and the swallows, for something in the first two large combinations, each of the three would have a bird that catches its insect food while on the wing. Humming bird may be substituted for kinglet, in No. 3.(?)

No. 1	No. 2	No. 3	No. 4
Robin	Wren	Bluebird	Wood thrush
Indigo bunting	Goldfinch	Chippy	Bobolink
Meadowlark	Rose-breasted grosbeak	Baltimore oriole	Blue Jay
Chickadee	Cedar Waxwing	Kinglets	Scarlet tanager
Redheaded woodpecker	Bobwhite	Downy woodpecker	Cuckoo

No. 5	No. 6	No. 7 (not found in Audubon pictures)	
Brown thrasher	Catbird	Brown creeper	
House sparrow	Song sparrow	Junco	(or substitute either
Red-winged blackbird	Cardinal grosbeak	Red-eyed viero	of these two for others in combination No. 7)
Nuthatch	Kingbird	Maryland yellow-throat	Yellow-throated vireo
Flicker	Redstart	Sapsucker	Kingfisher

For the kindergartners, we have picked out two sets of ten each, including most of the common and brightly colored birds, and especially those associated with children's poems and songs.

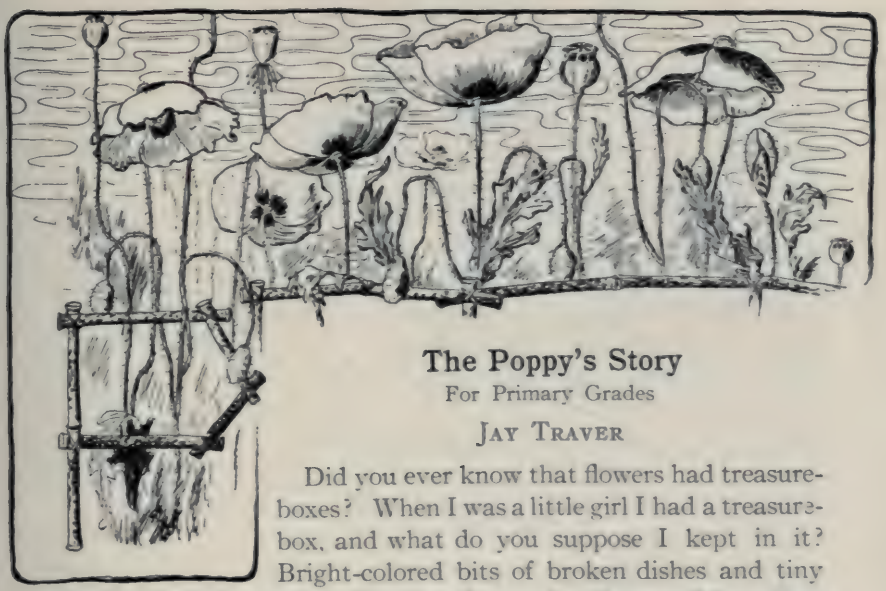
In planning to do color work with birds, we have several alternatives. Drawings may be made from mounted specimens. This is work properly belonging to the art department and has not given good results. Characteristics of beaks and feet in relation to the environment and food may be approached in some other way. Coloring a bird in outline according to a picture of the same size, shape, and posture is only practice in applying pigments. Adapting the color to the outline from a mounted bird or from a picture of a bird in a different position is at least one level above mere copy work. In this respect the Comstock bird plates have the advantage of calling for a little

more mental effort than the Audubon Society outlines intended for little children. The Audubon pictures, however, with their excellent backgrounds, serve as very good models and are more easily handled than pictures found in books.

This sketch would hardly be complete if mention were not made of another use that may be made of these plates, that of using them after coloring for cut-out work of various sorts. The cut-outs may be mounted in book form or pinned to the top rail of the blackboard. They may be stuck on various parts of a tree drawn in colors on the blackboard. By providing pasteboard backing and little flaps for insertion in slits, they may be perched on the trunk, branches or in the green foliage of trees drawn on large sheets of heavy paper. The tree itself may be part of the regular tree work of the nature-study.

Three Wild Plants Needing Protection

Three reprints of articles by Miss Britton published in the *Journal of the New York Botanical Garden* have been received. These three flowers are the fringed gentian, the liver-leaf or hepatica and the bloodroot. Each is exquisitely illustrated in color and Mrs. Britton befriends us all when she befriends these flowers. We should all help preserve them and keep them safe for the sake of future generations.



The Poppy's Story

For Primary Grades

Jay Traver

Did you ever know that flowers had treasure-boxes? When I was a little girl I had a treasure-box, and what do you suppose I kept in it? Bright-colored bits of broken dishes and tiny pieces of colored glass. But the flower has better things than that. It has many tiny seeds in its box. Here is the poppy that Lester brought us this morning. We notice its bright scarlet petals first. But look at the little green box just below the bright petals. That is where the poppy keeps its treasures. Let us play that the poppy will tell us a story about them:

Once upon a time I was a little, tiny, hard, brown seed. One day someone planted me in the moist warm, earth and before long I began to grow. First I sent two little leaves up into the sunshine, and then more leaves grew, and more. Don't you think my leaves are pretty? They helped me to get my food too—some day I'll tell you more about that. Then after a while my blossoms began to grow. At first they were buds—just like this one here. See how the stem above the bud bends over. And see how carefully I wrapped up the baby bud in its soft green blankets—just as carefully as mother wraps up Baby Brother. When it was big enough the stem became straighter and the blankets fell off, so the bud could spread out into a flower, with its pretty red petal dress. But you will have to watch very closely and be up early in the morning if you want to see the blankets fall off. Perhaps tomorrow morning you will see how it is done.

Why do you suppose my blossoms wear such pretty dresses? Perhaps you can find that out too, if you watch near a poppy bed? By and by, when the sun begins to feel warm, along comes Mrs.

Bee, looking for her breakfast. She sees the new scarlet dress on my blossom, and she knows that means there is something there for her to eat. Mrs. Bee does a kindness for me too. Do you see these little yellow specks on my stamens? My sister, Polly Poppy, lives just across the way, and she has some yellow pollen just like mine. We are always anxious to exchange pollen, because it makes our seeds grow better and bigger to have pollen from some of our sister poppies. Mrs. Bee does this for us, because she gets pollen from my blossom on her back when she is getting her breakfast (no nectary in poppies). But at the same time she leaves me some pollen from Polly Poppy, whom she has just visited. So you see the real reason why I put such pretty petals on my flowers, and have the pollen ready for Mrs. Bee. It is just to make my seeds grow in my treasure-box.

So when the seeds are ready to grow, the scarlet flower petals are not needed any longer, and fall to the ground. Now the little seeds are growing fast inside their little green box, and I am very happy. When they are all ripe and ready to go out in the world to make new poppy plants by and by, what do you think happens? Look at a green treasure-box. See how the edges are scalloped. Here is a ripe brown treasure-box. Do you see what has happened? The little partitions beneath the scallops have fallen back, leaving holes all along the upper edge of the treasure-box. Some day when the wind is blowing, go out in the garden and see what is happening to some of my sister's treasure-boxes. See how the stalk sways back and forth—and suddenly, out pops a seed! It is just like a salt-and-pepper shaker, isn't it? Only the grains of salt or pepper are really, truly poppy seeds. Perhaps next summer some of them may be in your garden, and grow into tall plants with many leaves and flowers and treasure-boxes, just as I did this year. Then you can watch them grow, and see if their story is like mine.

Once a man who loved children very much, wrote a pretty goodnight song about poppies. The man's name was Eugene Field, and this is the song he wrote:

"The Rockaby Lady from Hushaby Street
Comes stealing; comes creeping;
The poppies they hang from her head to her feet,
And each hath a dream that is tiny and fleet—
She bringeth her poppies to you, my sweet,
When she findeth you sleeping!"

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

VACATION, WAR, AND NATURE-STUDY

The question uppermost in the minds of many of us is, "How can we have a real vacation when deep in our inner consciousness is the harrowing fact that our boys are fighting in France!" Many of us, it is true, will take no vacation but devote that time to needed work for a world that seems to demand our utmost efforts. However, there are many who, in order to do the hard work of the year, must have the physical and mental benefit of a real vacation; and while it is true that in these perturbing days anything that does not contribute to the right solution of the great struggle in which the world is engaged, seems trivial yet if we are to do our part we must keep ourselves fit both physically and mentally.

Now of all times, when cares and anxieties weigh heavily upon us we have greater need for the rest which comes only from a complete change in the course of our thoughts; and this diversion is often attained most easily by going to the fields and woods; and the more intelligently we view the things which we see there, the more complete will be our recuperation. As was said long ago, "There is a great difference between the person who in the fields sees many flowers and the ones who sees many a flower."

For all these reasons we feel like urging all of those who can, to take up some special study out of doors this summer. Begin with and master as far as possible a study of the birds, or the trees, or the butteflies, or the ferns, or the flowers of the woodlands, or fields of the locality in which you are staying; or make a thorough survey of a brook or a pond with their surrounding

and included life Take up something definite by which, through the interest inevitably developed, you will be led on to farther study, and in the meantime you will forget your cares and the war.

You may feel that it is selfish and exclaim, "Have we any right to forget about the war for even an hour?" 'In answering this objection we should like to repeat a few earnest words said to us by Charlotte Kellogg the author of *The Women of Belgium* and the one American woman who went to Belgium officially connected with the American relief work; in response to the question as to how she endured the strain she said, "It was only by doing the common things,—performing the little ordinary duties and talking about them as usual, which made us for the moment forget the horror of it all, that we gained the strength to go on and endure all that we must witness and perform the tasks awaiting our hands."

THE EDITOR NOT ALWAYS A PROPHET

At the beginning of the year, believing that we knew what contributors to THE NATURE-STUDY REVIEW would like to write about, especially after they had received a hint, we announced with cheerful assurance the topics for each issue of THE REVIEW for a year. On the whole it worked well and the next year's topics are already announced and many good contributions are already in the proper pigeon-holes of the editorial desk.

This May number was to be given over to the garden flowers, their visitors, and a detailed study of that most useful garden product, the potato. Alas! no one seemed inspired to write about garden flowers; but Professor Vinal, always a live wire in the nature-study field, saved the day by sending in the best study of the potato that we have ever seen. However, so many valuable articles about other topics have been contributed that the May number is undoubtedly far more interesting than if the editorial plans had been carried out. After all, being a sure prophet must be very monotonous indeed; the only prophet that could find life interesting must be the one who has to keep a keen eye on events and note what percent. of his prophecies come to pass.

The Teachers' Corner

The potato is of such great importance at the present crisis in the world's history that it should be a topic for a nature-study lesson in every school in the land. Professor Vinal's admirable outline will prove an inspiration to all teachers of nature-study and gardening. For the lower grades—when the teacher cannot take up the more thorough study of this useful tuber—we suggest the following observation lessons:

The Plant

A spray of leaves from a potato plant for each pupil and if obtainable the teacher may have some of its cultivated or weed relatives such as the tomato or the egg-plant for comparison.

1. Is the plant really a vine as it is often called?
2. Is the stem round or angular, smooth or rough, hairy or prickley?
3. Do the leaves grow opposite each other on the stem or alternately?
4. Are the leaves simple or compound?
5. Are the leaflets of about the same size or regular as to their number?
6. Are the stems and leaves soft and juicy or woody and fibrous?

The Flower and Fruit

A spray of potato blossoms. Seed-balls are very rare of late years but an occasional one may be found and studied.

1. What are the color of the blossoms?
2. How are the flowers arranged in the clusters, in a spike or many branched?
3. Describe the parts of the flower; how many sepals form the calyx? Has the corolla separate petals? How many stamens are there and how are they placed?
4. Is the flower fragrant?
5. What color and shape is the flower?
6. When cut open how many seed-cells are found within?
7. What is the shape of the seeds and are they many or few?
8. Is the fruit pleasant to the taste?

The Tuber

One or two potatoes for each pupil, preferably of different varieties—long, globular, and with different colored skins.

1. Where does the potato grow?
2. Has the potato a smooth surface like an apple?
3. Are the "eyes" distributed regularly on its surface or scattered haphazard?
4. Where are the eyes most numerous, on sides, near the stem, or at the opposite end?
5. Is the skin thin and paper-like, or rough and netted?
6. Where do the sprouts start when the potato begins to grow?
7. Are any rootlets attached to the potato as to beets and turnips?
8. Of what is the flesh of the potato mostly composed?

A Civic Biology. George W. Hunter. 432 pp., illustrated. American Book Company.

"Boys have different biological interests from girls, and children in rural schools wish to study different topics from those in congested districts in large communities. The time has come when we must frankly recognize these interests, and adapt the content of our courses." So says the author in his preface; but, unfortunately, he adapts his course not to boys apart, nor to girls apart, but to "boys and girls living in an urban community." Therefore, some things that have hitherto been little in evidence in high school courses in biology, garbage cans, and sleeping porches, Petri dishes, test tubes and hypodermics, etc., loom large in this book, and three of the four portraits shown in the concluding chapter on "some great names in Biology" are those of Jenner, Pasteur, and Koch.

It is a good book, clearly written, well printed, well illustrated. It is above all else practical. It is intended to teach city pupils, rather than to teach biology. Terminology is reduced to an absolute minimum; as, for example, when the claws of a bee's foot may not be called claws, but are referred to as the "tiny hooks at the end" (p. 29).

Fortunately, though wild nature is eliminated from this book, there are a few things left in it to remind the youthful urbanite that his means of livelihood are still derived from Mother Earth. J. G. N.

The Apple. Albert E. Wilkinson. 492 pages. Ginn & Company. Price $2.

The author has attempted to bring order out of chaos of the great mass of literature dealing with the many and varied phases of apple-growing. He has endeavored to prepare a single volume "that would present in a logical manner the most essential of the recent practical ideas and methods" of the successful cultivation of this most important fruit. There are thirty-eight chapters in the book, of which the first deals with the selection of the site of an orchard and the last with the varieties which are desirable to plant. Between these extremes there are chapters dealing with "orchard heating," "planting," "fertilizing," "cultivation," "irrigation and drainage," "insects," "diseases," "spraying," "packing," "grading," "marketing," "renovating neglected orchards," "propagation" and other subjects. Certainly the list of subjects discussed cover the essential features of apple-growing and the information seems to be of a practical nature.

The chapter on insects is of special interest to the writer. The author has given a readable account of such notable pests of the apple as the codling

moth, the round-headed and flat-headed borers, the San Jose scale, the gypsy and brown-tail moths, the plum curculio and others. The illustrations are attractive and well chosen.

Some of the recommendations of control are hardly up-to-date. For example, it is not necessary to add milk-of-lime to arsenate of lead to prevent burning. The great advantage of arsenate of lead is that it contains less than .75 per cent of soluble arsenic and does not burn the foliage of the apple.

The Next Generation. Frances Gulick Jewett, Ginn & Co. 228 pp., illustrated. $1.

That the destiny of future generations lies in the hands of the men and women, the boys and girls of to-day, that they may lengthen or shorten, bless or curse their lives by what they know and by the way they put their knowledge to use is the theme of this little book. It is possible, we read to learn many facts about life itself and about what controls it. Science says "Human beings will be safer when people know the facts and are influenced by them." Teachers say, "Give us the facts and we will pass them on to the boys and girls we teach." The author says in effect, "Here is a book which gives these facts. By subject-matter and manner of presentation this book strongly recommends itself for the desired purpose. The main fact of evolution, how all life is influenced and molded by the three fates, heredity, environment and personal choice or will, is comprehensively and authoritatively stated. Anatomy, embryology, geology, geography and the experiments of man in breeding new varieties and species of plants and animals are called upon to give evidence of the fact and manner of evolution. How the life of every organism, be it plant, fish, bird, man, is passed on from one generation to the next by bits of protoplasm called germ cells is clearly told. We are made to see what happens when this stream of life becomes contaminated by alcohol, by nicotine, by disease due primarily to wrong living and spread through carelessness and ignorance. What happens is physical, mental and moral debility, blindness, deformity, idiocy, death. The way of safety from these evils is pointed out. Cleanliness, protection by law, right environment and good parentage are necessary to race improvement. But the greatest of these is good parentage. "The history of the human race proves that right parentage is the noblest gift which one generation may offer to another." The author urges that each generation take the laws of inheritance into account, pass on the best it has received and let its worst inheritance die with itself. This book deals well with a vital subject. Teachers will find here the facts of life for which they have been asking, and they are presented so clearly, logically, simply and interestingly that children may assimilate them with ease.

N. H.

The Pruning Manual. L. H. Bailey. MacMillan Co. Price $2.00.

This is the eighteenth edition of Professor Bailey's well-known book on the practice and principles of pruning fruit trees and vines. This new edition includes also a discussion of the comparatively modern practice of tree-surgery with special reference to the treatment of shade and street-trees.

Since the manual was first written considerable careful experimental data have been accumulated mainly through the work of the experiment stations. This has necessitated a revision and restatement of some of the principles expressed in the original book written over twenty years ago. The text is thus brought abreast of the latest results of research and investigation on the subject of pruning.

The work covers the subject in a broad, comprehensive manner as indicated by the titles of some of the chapters: The philosophy or rationale of pruning; the fruit-bud; the wounds and how they heal; the mending of trees; the principles of pruning; some special modes of training; American grape-training—general sketch, *et. al.*

The author divides the whole subject into (1) the fundamentals and (2) the incidentals. The fundamentals deal with the underlying principles or the philosophy of pruning while the incidentals treat more or less of specific method and practices of pruning. The author has no cherished methods of pruning trees. He gives no didactic rules of his own for shaping a tree. His attitude of mind toward the subject is shown when he says "A good part of the value of pruning lies in the conforming of the plant to regularity of shape and stature, making it convenient for the harvesting of the crop, rendering the plantation easy of tillage, and spraying and meeting the wishes of the grower."

Like all of Professor Bailey's writings, the pruning book is fascinating in style and in manner of presenting the subject matter and, although one may not be a horticulturist, yet after reading the book one feels as though the growing and pruning of a vine or tree would be the most interesting thing in the world. G. W. H.

The Child's Food Garden. With a Few Suggestions for Floral Culture, by Van Evrie Kilpatrick, President of the School Garden Association of America. The first volume in the School Garden Series, edited by John W. Ritchie. Cloth. Illustrated. 48 cents. World Book Company, Publishers, Yonkers-on-Hudson, New York.

We have always wondered why some one did not write a real child's garden book; and now Dr. Kilpatrick has done this very thing. It is an attractive little book, well illustrated and containing the simplest and plainest directions possible for planting and care of common vegetable and a few flowers. Part I is devoted to the preparation of the soil and care of the plants with directions for thinning, transplanting, harvesting, marketing and accounting. Part II gives information about the common vegetable, when to plant and how to care for each kind. Part III discusses the planting and care of a few common flowers. Part IV tells of the work that should be done by the gardener each month of the year. Part V gives methods of canning, drying and storing vegetables. Part VI contains information concerning a few fungus and insect enemies of plants. The book finishes with a very important appendix which gives a frost map for spring and fall. A time table for planting vegetables and flowers. A table for canning and drying vegetables and a list of searching questions that will test the child's knowledge of gardening. Professor Kilpatrick has given us a very valuable little book that should be in the hands of every child gardener in America this spring.

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THE
NATURE-STUDY REVIEW

VOL. 14 SEPTEMBER, 1918 NO. 6

The Sunflower

MARGURITE HESS
Lyons Falls, N. Y.

"Eagle of Flowers! I see thee stand,
And on the sun's noon-glory gaze;
With eye like his thy lids expand
And fringe their dish with golden rays;
Though fixed on earth, in darkness rooted three,
Light is thy element, thy dwelling air."

THE sunflower, or Helianthus, is named from helio, the sun, and anthos, a flower, from the belief that the flowers turned their faces toward the sun.

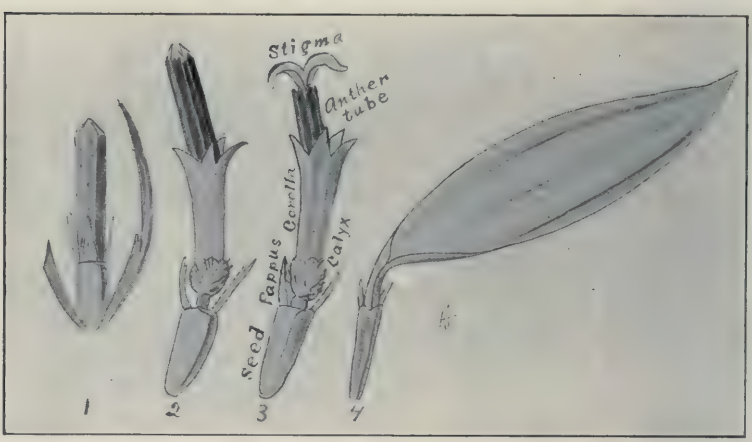
I am sure we all feel that there are few brighter, more sun-loving flowers than these. The plants grow from four to fourteen feet high, the stems being rough and hairy, the leaves large, usually alternate, petioled and varying in size and character. And the whole plant is characterized by its large, showy yellow flowers. All the sunflowers grow well in any common garden soil, most of them being easily raised from seed, while many readily form hybrids. Many species, however, are better adapted for the wild garden—but to combine size, hardiness, and luxuriant bloom, one must sometimes put up with coarseness.

The sunflower is not a single flower but a large head or family of flowers living together, each little flower having its own work to do.

There are two kinds of flowers in this head or family. The most showy ones are found on the outer edge and are called the ray flowers or banner petals. The rest of the flowers are more numerous and because they form a large disk in the center of the flower family are called disk flowers. They are also sometimes called tubular flowers as they are somewhat tube-like in shape. Each one of the little ray and disk flowers is called a floret.

The ray flowers have neither stamens nor pistils. Their only reason for existence is to make the head more conspicuous so as to attract the insects. At the base of the ray flower is a seedlike portion, which is a mere pretense. There can never be seed as it has no stigma connected with it to bring pollen, neither does it have stamens or tubular corolla.

The disk flowers, whose duty it is to set seed, have corolla, five stamens, and a pistil with a two-cleft stigma. The calyx consists of two or more layers of thin deciduous scales.



The Flowers of the Sunflower-head Enlarged

1. A floret of the sunflower in the bud-stage as it appears at the center of the sunflower. Note the protecting bract at the right.
2. A floret in earliest stage of blossoming.
3. A floret in the latest stage of bloom with the parts named.
4. A ray or banner-flower.

Let's go out into the garden and watch carefully for a few days one of these glowing heads. First notice the florets next to the ray flowers. The pollen is pushed out from the anther cases and lifted above the corolla tube, so that the pollen grains can be scattered. It is the growing pistil which pushes the pollen out. Perhaps the next day we go out we find that in a few more rings next these and nearer the center the same thing has happened, and so on, each day the ring of florets approaching nearer the center. Finally the pistil pushes up its style so that it stands above the end of the corolla tube. The style is divided into two slender parts which at first are closed up so the pollen cannot touch the stigma

on the inner surface. Later the parts curve outward. When the head has partly blossomed you can see the ring of ray flowers, then a ring of disk flowers, fully open with pistils projecting above the corolla tube, next a ring of disk flowers only partly open and in the center of the head are disk flowers not opened at all. I have seen sunflowers, in fact I now have some in my room, and it is the first of December, from which the banner petals have fallen, the outer rings of disk florets have gone to seed, the seeds are ripening and falling off, while the central disk flowers are still in bloom.

Bees and other insects are the frequent visitors of the sunflower. They crawl over the flowers and the bees drag the pollen from the open florets where the pistil is closed, to florets where the pistil is open. Since the pistils and stamens do not ripen at the same time, the pollen from one floret must go to the pistil of another floret, as it cannot get to its own. Taking the pollen from one flower to another is called cross pollination. This is good for the plant as it gives vigor to the life in the seeds.

During our few days study of this beautiful head of gold we learned other things besides its blossoming and fertilization. We learned that the flower itself does not turn with and toward the sun as many poets express and as St. Francis de Sales tells us in the following quotation: "The sunflowers not only rejoice at the sight of the sun, but follow with loving fidelity the attraction of its rays, gazing at it and turning toward it from its rising to its setting," a sentiment repeated by Moore when he sang,

> "The sunflower turns on her God when he sets
> The same look which she turned when he rose."

But we found that during the period of growth the leaves, as well as the growing stem are very sensitive to light. On sunny days the leaves on the growing end of the stem are drawn somewhat together so that they form a rosette. This rosette faces the sun when rising, the growing stem does also as this aids in bringing the upper surfaces of the leaves to face the sun through the day. Light has a great influence on the leaves. When the leaves are crowded you will notice each takes a certain position so as to receive light. The leaf does not take this position of itself alone, but is caused to do so by the light. The leaves open to the sun are larger and a brighter green than those in the shade. We all know it is necessary for the leaves to have light in order to carry on photosynthesis.

THE SUNFLOWER

Next to the ray-flowers are the florets in last stages of blossoming with stigmas protruding; next within are rows in the earlier stage with pollen bursting from anther-tubes, while at center are the unopened buds.

The sunflower was held in reverence by people of past ages. In the mythology of the ancient Peruvians, it occupied an important place, and was employed as a mystic decoration in ancient Mexican sculpture. Like the Lotus of the East, it is equally a sacred and an artistic emblem figuring in the symbolism of Mexico and Peru, where the Spaniards found it rearing its aspiring stalk in the fields, and serving in the temples as a sign and decoration, the sun-god's officiating hand; maidens wearing upon their breasts representations of the sacred flower in beaten gold. In the unfortunate Cathedral at Rheims they formed the aureoles of both the Virgin and St. John, the flowers turning toward the figure of Christ on the cross as toward their true sun.

We find Gerard the great English botanist of the sixteenth century, a great enthusiast over this great flower of gold. He said, "The Indian Sun or the golden floure of Peru is a plant of such stature and talnesse that in one summer being sown of seede in Aprill, it hath risen up to the height of fourteen foot in my garden, where one floure was in weight three pounds and two ounces and crosse overthwart the floure by measure sixteen inches broad. The stalkes are upright and straight, of the bignesse of a strong man's arme, beset with large leaves ever to the top of the stalke cometh forth for the most part one floure, yet many times there spring out sucking buds which come to no perfection; this great floure is in shape like to the cammonil floure, beset around about with a aple or border of goodly yellow leaves in shape like the leaves of the floures of white lillies; the middle part whereof is made as it were of unshorn velvet or some curious cloth wrought with the needle; which brave worke if you do thorowly, view and marke well, it seemeth to be an innumerable sort of small floures, resembling the nose or nozell of a candle-stick, broken from the foot thereof; from which small nozell sweateth forth excellent fine and cleere turpentine, in sight, substance, savour, and taste. The whole plant in like manner being broken, smelleth of turpentine; when the plant groweth to maturitie, the floures fal away, in place whereof appeareth the seed, blacke, and large, much like the seed of Gourds, set as though a cunning workeman had of purpose placed them in very good order, much like the honiecombes of Bees: the root is white and compact of many strings."

The Poets have written much of the Sunflower. The following are a few of these tributes:

"Miles and miles of golden green
Where the sunflowers blow
In a solid glow."—*Robert Browning.*

"The sunflower, thinking 'twas for him foul shame
To nap by daylight, strove to excuse the blame;
It was not sleep that made him nod, he said,
But too great weight and largeness of his head."—*Cowley.*

"With zealous step he climbs the upland lawn,
And bows in homage to the rising dawn;
Imbibes with eagle eye the golden ray,
And watches as it moves the orb of day.—*Darwin.*

"Unloved the sunflower, shining fair,
Ray round with flowers her disk of red."—*Tennyson.*

Two Different View Points

Edith Clark Maynard
Baldwin School, Bryn Mawr, Pa.

One warm morning in August, accompanied by our host's faithful dog, I strolled down to the hotel garden.

First potatoes, then corn we passed, and finally came to a field of five thousand cabbages. Over the cabbages, in the bright sunshine, were fluttering many white "cabbage butterflies" seeking the very best leaves upon which to lay their eggs.

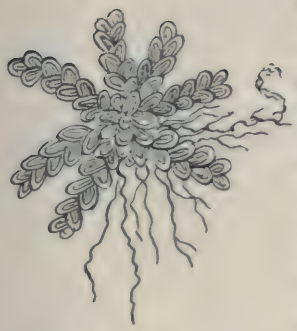
The depredations of the greedy green caterpillars were only too evident.

The whole scene recalled a conversation I had had with a teacher a few weeks before. She was supposed to teach nature-study. In speaking of her work she had said with enthusiasm, "I like to teach the life history of a butterfly because it paragraphs so well in English. Three stages in the life history, three complete paragraphs. You see?" Had she been with us that morning I wondered if any thought of English construction could have come between her and the scene before us.

Azolla

G. H. Bretnall

State Normal School
LaCrosse, Wis.



SOMETIMES one runs across the most exquisite beauty in the most unlooked for places. A swamp is generally considered to be a most undesirable thing and much more of an eyesore than a place of beauty. But those that have learned to know the swamp have found it to be full of surprises in the way of corners of unusual attractiveness. They have found it, during the summer, to be an ever changing panorama, each scene seeming more pleasing than the one before, till fall comes and the cardinal flower with its plume of flaming red ushers in the grand finale.

Much of the swamp vegetation is little known and the water ferns are so inconspicuous a part of this vegetation that one scarcely takes them into consideration; yet even these may minister to the pleasure of our walks. The Azolla which is perhaps the rarest of the water ferns may help make one of the most interesting and beautiful of our plant associations. This little plant which is in the form of a delicately branched frond of about an half inch in length and width floats on the surface of the water. It lives on the ponds which are shrunken lagoons and from the years we have watched it seems to appear every two years. Its history and where it stays during its two years absence is imperfectly known. But it must be in some form or stage of growth in the bottom of the pond. It must be getting ready for its appearance above. When it appears it is green and its dark greenness gives a pleasing contrast to other plants of lighter green. Its depth of color would catch the eye of an artist as well as that of the botanist or nature lover. Later in the summer it turns a rich red. The pond which is covered with the Azolla gradually changes through a series of hues from green to red. As it usually takes the whole pond it presents at this time a beautiful stretch of radiant red.

It is now that we get a rare beauty of the swamp in its fullness. Not only do we have the beauty of the plant itself, its delicacy and its color, but we have the contrast with the surrounding green and

this is what is so striking. We have here on a magnificent scale what the florist tries to get; such a combination of color and green as will be both artistic and delightful. The Azolla with its surroundings, however, rivals the florist's combinations. Beside there is the light and shade, the sunshine and shadow which the florist cannot get and the artist cannot copy.

These features came surprisingly to view one summer morning in late August of 1916. The Azolla of that year covered luxuriantly the ponds in the river bottoms of Minnesota opposite La Crosse, Wisconsin. Passing along the causeway which runs through the swamp I saw what was perhaps the prettiest piece of scenery I have ever seen. It was about seven-thirty in the morning and the slanting rays of the sun gave the right kind of light for the view. In the foreground was the Azolla, covering the pond with its brilliant red. On the further side of this pond, which was quite a large one, the Arrow Leaf gave the green contrast. Above and back of these stood the Cattails with a darker shade of green. As a background to all this stood the willows with their shades of green. The blue sky above, the different greens and the red, lighted by the morning sunlight made a combination of color and form I have not seen equalled. It was at once both exquisitely beautiful and magnificent. The Azolla has its beauty but the Azolla in its setting has the more beauty.

The ferns are always loved for their beauty. The water ferns when looked for may also minister to our tastes.

Notice

As a part of certain investigations now being carried on by the Department of Biology of the Western Illinois State Normal School at Macomb, Illinois, two hundred fifty young birds were marked during the past summer. A small white celluloid ring was placed upon the right leg of each bird. Most of the birds are robins but several other migratory species are included in the list. All were reared upon, or within one block, of the campus. It is hoped that some data concerning the movements and habits of the young birds after leaving the nest and during next year may be obtained. If anyone who observes a bird marked as indicated above will let us know, it will be very helpful to us. Address any communications to C. W. Hudelson, Macomb, Illinois.

The Goldenrod

GEORGE H. RUSSELL
Winthrop, N. Y.

Goldenrod is one of the most common and perhaps in the rural districts the most unappreciated flowers of our country. Because we have seen it all our lives, little have we realized the beauty and value which this flower possesses and is offering to us everyday of its blooming.

It nods and becks to us with a happy good morning, for it is always up in the morning before we are, no matter how we may try to be the "earlier bird." For it wants to shine and glitter in the sunlight all it possibly can, as in this way it reveals its glowing beauty. So in at least this one respect, we may look at it as human for we, all of us, though we may never admit it, endeavor to avail ourselves of every opportunity to manifest our goodness to our friends. We are not always as fortunate as this flower though, for its beauty lies very near the surface, and under the sun's rays, beams forth radiantly.

I would aim to persuade my friends to recognize this pretty flower and give it the attention and credit long due. For its eager efforts to attract us are often, yes usually, in vain. Many of us will arise on a beautiful sunshiny morning with a very apparent ill-feeling toward everything. A grouch is the common name for this unhappy and unnecessary state. We will not notice nature's beauty when we go out doors and so look with disdain upon our true friends the goldenrods, who are welcoming us. However, they are never discouraged or made angry, and the next morning the same flower will nod to us and act just as friendly as if nothing had happened. Unfortunately the eyes of many are closed to these

beauties and will never recognize these friends, no matter if they keep nodding all their lives.

A little poem by Carrie W. Bronson brings out this friendly manner of the Goldenrod.

LADY GOLDENROD

O, pretty Lady Goldenrod,
I'm glad you've come to town!
I saw you standing by the gate,
All in your yellow gown.
No one was with me, and I thought
You might be lonely, too;
And so I took my card-case
And came to visit you.
You're fond of company, I know;
You smile so at the sun,
And when the winds go romping past,
You bow to everyone.
How you should ever know them all,
I'm sure I cannot tell;
But when I come again, I hope
You'll know me just as well.

The goldenrod belongs to the composite family which is the largest of all botanical families, as it contains one-tenth of all known species of flowering plants. About 80 species of this plant are native to the United States, 42 of which are found in the northeastern states. Many of these are difficult to identify.

Sometimes it is tall and straight, a poplar among flowers, a true rod of gold. Again, it is a graceful falling fountain of color, or a long, wavy, showy plume. Graceful or stiff it is a flower to be proud of—a true "national" flower, strictly indigenous. We may understand its worth when we try to imagine what our fields, roadsides and woods would be if bereft of its cheer. Certainly our American autumn would lose one chief element of beauty.

Goldenrod predicts the coming of the fall and winter. A poem by Margaret Deland illustrates this relation to the season:

O Rod of gold!
O swaying sceptre of the year
Now frost and cold
Show winter near,
And shivering leaves grow brown and sere.
The bleak hillside
And marshy waste of yellow reeds,
And meadows wide
Where frosted weeds
Shake on the damp wind light-winged seeds
Are decked with thee,—
The lingering summer's latest grace
And sovereignty.

Each wind-swept space
Waves thy red gold in Winter's face—
He strives each star,
In stormy pride to lay full low;
And when thy bar
Resists his blow,
Will crown thee with a puff of snow!

During the early summer, green stems arising from the perennial roots spring up everywhere. Towards the last of July and first of August, flecks of yellow appear on the tips of branches. This plant is one of bright and generous bloom. It lights up the dark swamp with spots of glowing gold—fringes roadsides with tassels of inimitable grace—dots open woods with miniature circles of golden beauty. It is very common in open fields and is present everywhere except at seashores. No ground is so hard and dry as to forbid it. Because of this, it has been argued that the Goldenrod has a just and fitting claim to be considered our national emblem.

The goldenrods have two distinct kinds of leaves. One is called a feather veined leaf and the other a three-ribbed leaf. All of the goldenrods therefore can be divided into two groups, distinguished apart by the kind of leaf. Beyond this leaf difference, there are other distinguishing characteristics of the plants, in relation to the flowers and the plant stems.

One species follows another so that we have some from early August till late autumn. The species which I have chosen is the Solidago Canadensis, the Canadian goldenrod and it is so plentiful that it is also called the "Common goldenrod." It begins to bloom about the middle of August and continues through September. It is very abundant and widely distributed being common almost everywhere especially in copse borders, on roadsides and in dry situations.

This species is often quite variable. It has a tall, stout, round, leafy stem from three to six feet in height. It is rough-downy or hairy to the touch and of a light yellowish gray color. Usually it has slightly toothed leaves, with those near the top almost toothless. They are triple-ribbed, rough above and a trifle wooly beneath. They taper to a point at either end, are quite long and narrow, the color being a deep green.

The flower heads are small, so that in order to attract the attention of insects, they are set closely together along the stem, giving a mass of color. These flower clusters spread with graceful curves in an ample plume sometimes one-sided. They grow on the curving

branchlets on the top of the stalk. The flower heads are small and golden yellow, consisting of both ray and disc flowers. There are from 5 to 15 short rays.

The central tubular florets are perfect, and are cross-fertilized by many insects of many orders, chief among which are bees, butterflies and the beelike flies. The disc flowers, only, have stamens with pollen while the banner flowers have no pollen but only a pistil. The pistils of the disc flowers are within the pollen tube and push their way up thru,' pushing out the pollen at the top. Small insects quickly dislodge it, then elongation continues and the top of the two parted pistil begins to protrude and finally expands its tips, disclosing at the center the stigmatic surface, which has until now been protected by close contact. The pollen is scattered to the stigmas of neighboring flowers and cross fertilization results.

The flower heads set closely together along the stem

The banner flowers closely arranged give a wonderful mass of color and attract insects thus. The flowers furnish an abundance of nectar for all.

This species propagates both by seeds and by rootstocks. The seeds are provided with pappus, and are scattered about by the wind in November and December. The flowers never close up except when forming their seeds. This species also has creeping underground stems which are perennial and from these spring up new plants.

The goldenrods are weeds of course, but are not very troublesome like the wild carrot and daisy. On the other hand they are widely noted for their beauty and without them the roadsides and open fields would not be nearly as pleasant and enjoyable to the passers-by as they now are. They cannot be cultivated; at least florists have been successful with only a few species.

In the country around my home, the goldenrods are very abundant, especially along roadsides. Many time I have driven along sandy roads on days so hot that everything would have a

withered and drooping look but not so the goldenrod. It would stand there proudly trying to show its golden plumes and produce a fresh appearance—although the bright yellow was greatly dimmed by many coats of dust from the highway near by. It would never give in, but would wait patiently until a friendly breeze or a welcome shower should come to its rescue and remove the dusty warm burden from its countenance. To see the change in these flowers after a rain, with their newly awakened bloom teaches one the lesson that to remain patient and to put on the best appearance possible under unpleasant conditions will in time bring good results.

The literature on the goldenrod is very abundant. It offers a very good theme for poets, especially the nature loving poets and we have many interesting and pleasing lines about it in our nature books today.

In "Little Folks Lyrics" Sherman speaks of the autumn as being the evening of the year which comes just before the winter's night. He tells of the goldenrod which lights up the roadsides in the evening just as do street lights and greets the butterflies and bees as they are returning from distant meadows. Finally the frost comes with darkness and puts the torches out. The proud manner of this flower is illustrated in some lines written by H. H. Jackson:

Four oak leaves vivid green,
Hung low among the ferns, and parted wide,
While purple aster stars, close side by side,
Like faces peered between.
Like maiden faces set
In vine-wreathed window, waiting shy and glad.
For joys whose dim, mysterious promise had
But promise been, as yet.
And, like proud lovers bent,
In regal courtesy, as kings might woo,
Tall Goldenrods, bareheaded in the dew,
Above the Asters leant.
Ah, me! Lands will be lit
With every autumn's blaze of Goldenrod,
And purple Asters everywhere will nod
And bend and wave and flit.

There are many other fine poems, attractively written but I will close with just one more which gives a fine description of a September day. It was written by Mary Clemmer Ames:

"I am alone with nature,
With the soft September day;
The lifting hills above me,
With goldenrod are gay.
Across the fields of ether
Flit butterflies at play:
And cones of garnet sumac
Glow down the country way."

The autumn dandelion
Beside the roadway burns;
Above the lichened boulders
Quiver the plumed ferns.
The cream-white silk of the milkweed
Floats from its sea-green pod;
From out the mossy rock-seams
Flashes the goldenrod.

Notes on Fruit of Mountain Magnolia

N. M. Grier
St. Louis, Mo.

The writer's attention was called to a curiously misshapen fruit cone from a mountain magnolia (Magnolia acuminata L.). Investigation showed that the original tree, as well as others in the vicinity, bore a large quantity of similar ones. It will be remembered that the fruit of this species superficially resembles some of the larger, and more cylindrical pine cones, and is ordinarily three or four inches in length. The abnormal fruits, for their part, were lumpy in appearance, unsymmetrical in development, corkscrew in shape, or otherwise twisted about their long axis, some resembling the head of a bird in shape, and all shorter.

With the view of ascertaining the probable cause of this abnormal development, the writer made dissections of a number of cones. No sign of insect injury, or parasitic growth was found, but on the other hand, there was observed to be differences in the size of the fleshy follicles composing them, accounted for by the size of the seeds within them. The abnormal fruits contained numerous ovules which had evidently never been fertilized, and the corresponding portion of the cone showed signs of atrophy. The seeds in this fruit are described as being distributed one or two in each carpel; two seeds were noted, but in half of the cases examined, one had never developed. These cases were interesting since there seemed to be plenty of opportunity for cross-pollination. It was apparently clear then that the distortion of the fruits was due primarily to want of complete pollination resulting in an uneven distribution of maturing seeds throughout the cone. The development of the seeds producing the mechanical force requisite.

The Mountain Lake

HAROLD GORDON HAWKINS

At dusk I stand beside a silent lake
While shadows fall and surrounding woods partake
Of all the mystery and grandeur of the night.
Ah truly it is a glorious sight
To watch the sun's last radiance die
In darkling waters, while the sky
Is radiant with glorious colorings.

Softly, sweetly, a tiny woodthrush sings
Her evening hymn; the woodland rings
In fullness of the sound melodiously,
While in the blackening lake all somberly
The fir trees watch the undulating forms
That are their doubles in the shadowy depth below.

And now begin faint rustlings in the wood
And all about this place where I have stood
The last hour past. The gathering gloom
Is startled by the bullfrog's gutteral boom
From his nightly seat by the plashing water's edge,
While at the hilltop on a rocky ledge
Outlined in silhouette, an antlered deer
Stands gracefully and shows no sign of fear.

But now the blush of day receding fast
In the western sky leaves me alone at last
With night and her myriad stars,
While on the lake in shimmering bars
Diana's splendor shines and I
Am lost in silent contemplation of the scene.

Studying Butterflies

Amanda Zesch
Senior Student in Harris Teachers College, St. Louis

The study of the metamorphosis of butterflies should begin with the egg. The student can collect eggs on walks through the woods, and sometimes even from plants in backyard gardens. The collector can easily distinguish the eggs of butterflies from those of other insects by remembering that butterflies' eggs are laid singly on the underside of the leaf and are often iridescent. Sometimes the collector, will be so fortunate as to see the butterfly deposit her egg, and in this case there will be no chance for a mistake to occur. In gathering the eggs the student should take with him the whole branch upon which the eggs have been laid, and later place them in a receptacle. It is best to place the eggs in a dish or cage suitable for rearing the caterpillars. Cages consisting of little wooden frames covered with wire netting and set over boxes of damp earth or sand, large lamp chimneys set on flower pots of damp earth or sand and covered with a piece of glass, or dishes two or three inches high covered with a piece of glass, may be used. If a cage or flower pot is used, the end of the branch should be stuck into the sand, the branch being turned so as to give the best position for observation; if a dish is used, the branch should be merely laid in the bottom. If the observer does not know the age of the eggs, it is advisable to keep fresh plant food in the receptacle so that, when the eggs hatch, the young will have fresh food at hand. For this purpose, the same species of plant as that upon which the eggs have been found should be used.

When the caterpillars hatch, it is absolutely necessary to observe these laws: first, the homes must be kept clean; second, a constant supply of fresh food must be on hand; and third, the caterpillar must not come in contact with the direct sunlight. If the student follows these laws, he will have no trouble in rearing the caterpillars. To clean their homes, the student should turn over the dishes on paper to remove the contents, should rinse and dry them thoroughly, and should then put in a new supply of fresh food. This should be done at least once a day. To return the caterpillar to his clean home, it is best to put the branch upon which he is resting back into the dish; all unnecessary leaves should be removed from the branch, and the twig should be placed in such

a position as will enable the caterpillar to get fresh food. This will avoid unnecessary handling of the caterpillar. When the caterpillar is nearly full grown, he should be furnished with some support, such as a stick, to which he can attach himself. When the caterpillar has changed into the chrysalis, it is best, if he has been kept in a shallow dish, to remove the chrysalis and support to a larger receptacle so that, when the butterfly emerges, he will have room to spread his wings.

So far everything that has been said has dealt with the care of the caterpillar; next the mode of observation must be considered. For the most systematic study, regular intervals for observation must be decided upon from the very beginning, and all observations, with their dates, should be carefully recorded. These observations can be made only by close, prolonged study of the specimens; the observer must always bear in mind that it takes time and sharp eyes to see the very slight changes which sometimes occur in nature. Oftentimes sketches, diagrams, and photographs will be of great assistance. For observations I have found the following outline of great assistance. This outline gives the points which should be observed during the study.

1–1 Egg stage.
- 1–2 Placing on food plant.
  - 1–3 Conspicuousness.
  - 2–3 Side of leaf upon which it is placed.
  - 3–3 Kind of plant upon which it is placed.
- 2–2 Size.
- 3–2 Shape.
- 4–2 Iridescence.
- 5–2 Changes in color during development.
- 6–2 Escape of caterpillar.
  - 1–3 Mode.
  - 1–3 Place.
  - 3–3 Eating of egg shell.

2–1 Caterpillar stage.
- 1–2 Shape.
  - 1–3 General outline.
  - 2–3 Armory.
    - 1–4 Osmateria.
    - 2–4 Spines.
    - 3–4 Hairs.
  - 3–3 Value in protection.

2–2 Color.
  1–3 Changes.
    1–4 In species of same age.
    2–4 In stages of metamorphosis.
  2–3 Arrangement.
  3–3 Value in protection.
3–2 Structure.
  1–3 Head.
    1–4 Eyes.
      1–5 Simple.
      2–5 Compound.
    2–4 Mouth-mandibles.
  2–3 Segments.
    1–4 Number.
    2–4 Flexibility.
  3–3 Legs.
    1–4 Kinds.
      1–5 True legs.
      2–5 Pro-legs.
    2–4 Number.
    3–4 Position.
    4–4 Use.
  4–3 Spiracles.
4–2 Changes.
  1–3 Intermediate moults.
    1–4 Time—relation between intervals.
    2–4 Process.
    3–4 Use of silken pad.
    4–4 Changes produced by moulting.
  2–3 Final moult to chrysalis.
    1–4 Preparation inwardly.
    2–4 Preparation outwardly.
      1–5 Girdling of silk.
      2–5 Mode of final moult.
      3–5 Attachment of end into silk pad.
    3–4 Comparisons.
      1–5 Between chrysalis immediately after moult and half hour later.
      2–5 Between size of caterpillar and size of chrysalis.

3–5 Between size of butterfly and size of chrysalis.

3–1 Chrysalis stage.
- 1–2 Size.
- 2–2 Shape.
  - 1–3 General outline.
  - 2–3 Evidences of
    - 1–4 Proboscis.
    - 2–4 Legs.
    - 3–4 Antennae.
    - 4–4 Wings.
    - 5–4 Segments.
    - 6–4 Spiracles.
  - 3–3 Protection.
  - 4–3 Changes.
    - 1–4 Changes when touched.
    - 2–4 Final change to butterfly.
      - 1–5 Means of escape.
      - 2–5 Condition on escaping.
        - 1–6 Comparison with dry adult form
        - 2–6 Method of drying.
          - 1–7 Means
          - 2–7 Length of time.

4–1 Adult butterfly.
- 1–2 Color.
- 2–2 Shape.
  - 1–3 Head.
    - 1–4 Eyes—especially the compound.
    - 2–4 Proboscis—use.
    - 3–4 Antennae.
      - 1–5 Use.
      - 2–5 Shape.
  - 2–3 Thorax.
    - 1–4 Wings.
    - 2–4 Legs.
      - 1–5 Size.
      - 2–5 Structure.
      - 3–5 Number.
  - 3–3 Abdomen.

The eggs of the black swallow-tail butterfly, enlarged.

My first experience in this study was with the black swallow-tail, *Papilio asterias*. I found the eggs on the parsley plants in our garden. They were most beautiful specimens, in their bluish iridescence resembling little opals rather than the eggs of insects. I placed the little treasures in a dish, which I covered with a piece of glass. For two days I watched them, and at the end of the second day I observed a black speck on one of the eggs. I examined it with my lens, and there I saw one of the wonders of my life: a tiny wiggling creature eating a hole in the egg shell so that it might escape from its prison. Soon the hole was large enough; the little caterpillar then placed its true legs on the outside of its prison, and with these as a support pulled out the rest of its body. With its little, but powerful, mandibles it began eating the egg shell, but soon stopped as if the task were too difficult. Soon it began wandering about looking for food. I pushed a fresh parsley leaf near it; it soon discovered it, crawled upon it, and began to eat the tender parts of the leaf.

It was a pretty little creature in its black dress, with a white belt across the middle of its body, and black spines tipped with orange. It did not keep this dress very long, but exchanged it for one of light green striped with black, in which were rich orange dots. This change was brought about on the seventeenth day by the third moult. I was neither fortunate enough to observe its first moult which occurred on the third day; nor its second which occurred on the ninth day; but I did observe the third. I watched it eagerly as the little pad of silk was spun, as the skin broke behind the neck, and as the little mask came off its face, and as it wiggled itself out of the remaining skin, which it left behind in a shriveled mass. At first the face was a plain green, but, in a few minutes, faint stripes began to appear, and at the end of the second hour the stripes on its face were as black as those upon the rest of its body. A fourth moulting occurred on the twenty-fourth day.

The life of the little creature was marked by system; there was little variation in its routine of feeding, resting, and moulting. Even its feeding was done by system; every leaf was eaten in the same fashion, and never a bit was wasted.

On the twenty-ninth day a change came over it; it was no longer the easy-going caterpillar. It became restless, it refused to eat. It emptied the alimentary canal, and in every way it looked as if it were ill. It wandered here and there and was in a great hurry to get nowhere. At last it stopped on the side of the stem, and remained quiet for a short time. It then moved its head to one side and attached a silken thread; it next spun a long thread, and

Caterpillar of Black Swallowtail in two stages of growth.

attached it to the other side of the branch, thus forming a loop which it swung over its body. Back and forth it swung the thread, making the fastening more secure. Little did it seem to realize that, if it did not secure it tightly, death must follow. How carefully and consciously would we have done an act from which life or death might result! For twenty-four hours it hung there motionless till the fifth and final moulting occurred; this seemed to be the most difficult of all the moultings. After a while it succeeded in freeing itself from the skin; and now appeared the light green chrysalis dotted with gold. For nine days it hung there motionless, showing signs of life only when touched. On the tenth day the light green chrysalis darkened, and in the afternoon a large black creature emerged. Its wings were moist and crumpled and seemed too heavy for it to carry. It constantly moved them

back and forth and soon made attempts to fly. The wings gradually straightened and dried. At last the insect showed all its beauty; it was no longer the dark, ugly thing that emerged from the chrysalis, but a black, velvet butterfly, the beautiful black swallow-tail. It was a most perfect specimen. After watching it for a while, I opened the receptacle and made my much admired prisoner free. Away it flew to continue a life history which has been unvaried for ages.

From observations such as these the nature-lover derives much enjoyment as well as a knowledge of some of the many wonders which nature holds for him.

Black swallow-tail butterfly

Over the fields where the brown quails whistle,
Over the ferns where the rabbits lie,
Floats the tremulous down of a thistle.
Is it the soul of a butterfly?

—*T. W. Higginson.*

Asters

EDA G. MILLER
Wilkesbarre, Pa.

"Behold! the maize fields set their pennons free,
In this rich golden ending of the year;
And asters bloom upon the sunny lea,
Smiling as sweet as May, though leaves turn sere."
—*John Stuart Thompson.*

LOITERING up by every roadside, in fields and woodlands, may be seen the goldenrods and dainty asters nodding and smiling at one another from early August until late October. And right royal emblems they make for the fall of the year, a season of maturity and harvest. Both groups are in their prime of bloom from the middle of September to the middle of October, and it is during that time that a drive along a country road bordered with the soft white and deep purple bloom of asters touched with splashes of sunny goldenrod, presents a picture not easily surpassed. It is a sight that makes one exclaim with Longfellow,—"With what a glory comes and goes the year."

Both groups of flowers belong to the Compositæ, the largest of the plant families, and both have very diversified forms and habits. Gray's manual lists seventy-seven species of widely different forms, varying in size, color and also as to habitat. You find asters bordering the woodland paths, along the roadsides, on the hillsides and in the low swamp lands. You find them on the hig mountains and if you visit the seashore you will find them growing there. They differ widely as to shape of leaf. Some have long slender leaves, others shorter, lance-shaped leaves that clasp the stem, while still others have heart-shaped leaves on long, slender petioles. In fact it is mainly by the shape of the leaf plus the arrangement of the flower heads and their color that the different species are distinguished. The number of ray flowers is quite constant for a species, so that also helps in classification.

As is the case of all the Compositæ, what appears to be a single flower is in reality a host of tiny florets packed closely together on a flat receptacle or disk. In the aster, this flower head, as all the florets together are called, is surrounded at the disk by an involucre

of bracts, and is composed of two kinds of flowers. Those in the center, called disk flowers are very small and have a five-lobed tubular corolla fringed at the base with short white hairs. They are sometimes bright yellow and sometimes orange red to purple in color. They contain a pistil and five stamens. Surrounding this central disk are the showy banner flowers whose corollas have been prolonged into long tubes split down one side, making them look like long banners. These are colored white, pink, pale lavender to deep purple according to the species, and give to the flower heads the peculiar star-like appearance that inspired the scientists of old to call the flower "aster" which means a star.

1, an aster flower-head enlarged; 2, a disk-flower; 3, a banner-flower

Let us examine a disk-flower and see what provision the plant makes for fertilization. In the center of the flower-head we find the little flowers closed up tight, the tips of the five pointed corolla tube meeting at the center. They look like little pentangular balls. Towards the outer edge we find flowers at different stages of development, those in full bloom at the outermost edge. Here we see the aster's trick to prevent self-fertilization.

The anthers are joined into a tube but the filaments are separate and fastened to the corolla. The anthers split open lengthwise on the inside of the tube. The pistil is two-branched and provided with sweeping hairs like a duster. It pushes up through the stamen-tube after the pollen is ripe and brushes the pollen out before it, so that early in the morning, before the insects have arrived, we can see little circles of pollen piled up around each little floret of the aster head. The branches of the pistil do not spread apart and expose the stigmatic surface until they have grown

well up above the stamen tube and out of reach of the pollen of its own flower. After it has done this the pistil is ready for the friendly insect, laden with foreign pollen grains to brush against it in its eager search for the nectar that lies in the bottom of the flower cups. Such is the mechanism of all asters for securing cross-fertilization. This probably does not insure against fertilization from the same flower-head but by all indications it does prevent self-fertilization of a single floret.

It is a hard task indeed, even for a botanist to know all species of asters by name. Perhaps the most popular and the one most easily recognized is the large purple aster or New England aster. Aster Novæ-Angliæ, as Mr. Gray calls it. It grows so tall and stately that it attracts the attention of even the disinterested wayfarer. It is the tallest of the asters, sometimes reaching a height of seven or eight feet. The stem is very stout, reddish in color and covered with fine bristly hairs. Its leaves are lance-shaped, rather thin, slightly hairy and clasp the stem at the base almost encircling it. The flower-heads are very numerous and clustered at the top of the stem and tips of branches. Each one is large, being nearly two inches broad. The disks are orange-yellow changing to reddish brown with age. The ray-flowers, forty to sixty in number are very long and usually colored a very deep purple. It is a singularly handsome aster, with its fine free gesture, as stately as a queen.

Simply because its petals are purple, it has been called the widow of flowers. A poet has carried this idea out in a poem entitled "The Asters and the Goldenrod."

"Right wealthy is the Goldenrod,
A very Croesus he;
The widowed, weeping Asters came,
To crave his charity.

He gave them each a piece of gold,
Yellow and round and bright,
They clasped it in their purple robes,
And beamed their deep delight.

Then Goldenrod with stately nod,
And glowing features cried,
Come every fall, and with you all
My gold will I divide!"

All the sunny cheer that the autumn fields give us seems generally to be ascribed to the goldenrod, and the aster is made the symbol of the sadder tone of the season:

"Yet o'er one corner wildness still held sway,
And there, I always felt a shadow lay,
In that strange spot pale purple asters came,
When earth wore gorgeous colors on her breast,
And fields were ripe, and autumn's flood of flame
From scarlet maples swept from east and west
They bore no wealth of royal purple bloom,
But seemed meet products of great Nature's gloom.
Perhaps even such bright lands may need to see
The purple asters of despondency."

—*Wentworth H. Eaton.*

The New England Aster is found wherever there is moist soil, in fields, meadows, roadsides and waste places. It was once cultivated in Europe on account of its beauty, but has escaped and is now locally naturalized there. In spite of the name, the plant is more common in the middle western states than in New England. Though possessing a color generally associated with shadows and gloom, the graceful purple aster to me is as a beautiful lady with heart of gold giving cheer and comfort to every passer-by.

Deo Volente

Wm. Prindle Alexander

When the great Chemist Death shall once prepare
The final draught for me, and straight undo
This atom dwelling, all beyond repair,
And I the guest, am hurried unaware
Into the realm of elements anew,
'Mid rolling worlds, and tracts of endless blue;
Shall I return to where my passions burned
Of old, and where my every fibre sang
When in the cycles I again am turned
To something conscious of a joy or pang?
Or will forever silently be urned
The dreams of Now, and truths I sought unlearned?
I would implore my future state to be
Here in my joyfilled, carefilled Arcady!

The Founder of a City

Helen Lee Sherwood
New York City

I

A ROYAL WEDDING

Under a flat stone in the garden there was great excitement one sunny morning in late August, for a marvellous wedding was about to take place. If you had walked between the rows of autumn flowers of royal gold and purple and the ripe melons and egg-plant, or under the loaded apple trees you would not have noticed, probably, the little, flat, gray stone at the foot of one of the trees. But if you had chanced to sit down near it you could never have guessed what was happening beneath it, nor have heard the quick, nimble steps of thousands of tiny feet and the little insect voices. You have never heard of so grand an occasion as this was to be, nor of so strange a wedding—of all the royal brides and grooms in the garden!

Under the stone there was a great city of ants, with well built streets leading downward to galleries and chambers of all sizes and shapes. Some of them were used for nurseries—fitted with hundreds of baby ants. Others were built around dandelion or grass roots where herds of snowy or green ant cows were stabled and pastured. There were secret pathways winding to hidden places of retreat; and on the surface of the ground beneath the stone, the entrances to the city from the vast world outside were guarded and concealed by pillars and barriers, and watched by tiny sentinels with quivering antennæ that caught the scent of every breath. There was no lonely spot in all the city; the tiny brown ants were always passing back and forth with quick steps full of eager energy. It was a wonderful energy, which only a few of us possess who live in human cities. It was a ceaseless and untiring spirit, enduring hunger and danger and weariness for the sake of the ant children who would grow up to keep this city living and to go out and build new cities under other stones in the garden.

As soon as the sun had warmed the stone a little on this morning one of the princesses of the city came hurrying from a hidden room to the top, as if she knew it was her wedding day. She was a beautiful creature three times as large as the worker ants of the city. From the tip of her forehead to the sting on the end of her

round abdomen she was three-eights of an inch long. The workers who were passing up and down the city streets were nearly blind, although they walked so swiftly. They each had two compound eyes and three tiny simple ones, but they could see only dim lights and shadows. It was with their delicate antennæ that they smelled and felt their way about as they worked. But the Princess had eyes that could see! There was another thing she has, of which she was proudest of all. It was much better than a crown. On her high shoulders she bore four wings of magic, silvery gauze with fine brown veins making a delicate pattern. The tiny second pair were hidden beneath the first, which reached beyond her body as they lay folded on her back. The workers had never had such wings although they were her sisters, for they were not royal. They had always had to run along the earth and climb up the grass blades and flower stalks in search of food, but she could fly!

The Princess could wait no longer to go for the first time out of the city gate, and to use her eyes and wings. She hurried along the widest street, scarcely meeting anyone, until she came near the entrance. Here were groups of guards and road makers, the latter hurrying excitedly about making the street wider. The Princess was very angry on being seized by two of her legs and dragged gently back to a place where four workers were standing. They escorted her to the royal chamber from which she had escaped. Here she found twenty-five of her winged sisters and ten little winged brothers hurrying about and being washed and combed and fed by swarms of excited waiitng maids and pages. Your eyes would have to be very sharp to have seen the tiny tongues with which they cleaned the smooth, hard bodies and thin wings of their charges. All the princesses were very large and their bodies were round and strong with the food which the eager, half-starved workers had been bringing home to them for many weeks. The princes were no bigger than their pages but they had wings, too. They were slim and graceful and quick of motion.

Early in the afternoon the Princess who had tried to escape was on the broad street by the entrance, again. Now the street was crowded and the whole city seemed full of holiday gaiety. Behind her were all her princess sisters and the ten princes, with hundreds of attendants, and every street at the top of the city was seething with ants. The Princess at the front ran back and forth feverishly. Could she have known what a glorious thing was soon to happen to

her, or was it only an instinctive passion that she did not understand? All at once something made her rush ahead, followed by all the other royal children. Perhaps the mysterious ant instinct made some sign or rang a curious wedding bell that was heard in every city of little brown ants throughout the garden. For as the Princess rushed from under the stone other winged brown ants came running out from beneath other stones; each one at eager to see and fly as she was.

She stopped, with the bright yellow light in her eyes—as her brothers and sisters hurried out. A little breeze came and her wings seemed to spread themselves. She was flying up and away in the sunlight, and the earth was green and purple and golden! The sunny air was filling her body with its lightness and she flew faster and higher, seeing nothing but yellow light. Suddenly she felt a swift thing brush her body as it flew by—and she was in the midst of a swarm of flying ants, with wings that flashed with rainbow colors.

They flew and flew for hours above the garden, drinking the sunlit air. After a long while a lithe little Prince with sparkling wings flew close to the Princess and touched her lightly and stayed beside her as they went on. The ant swarm became smaller as some grew tired and flew to the ground. When there were scarcely any left the Prince and Princess fluttered down together, full of love for each other and of the sun's breath. They reached the brown earth and rested under a grass blade. Their wedding was over and the tiny Prince had poured his life into a sacred sac in the body of his Queen. As she watched him crawl away to a dark hiding place perhaps her wild joy left her,—or else her instinct did not tell her that her little King's life was of no more use and he would never dance about nor fly or even eat, again. He had given her all the energy he had, to keep for the many years she was to live, and in a few days or weeks he would die. When the Queen had rested thoughtfully for a while she slowly walked away, under the grass blades and flowers.

Her instinct led her on and on over the rough earth, and stones, and once she was almost caught by a cruel spider who hung in her web across the Queen's path. The sunshine grew fainter and less warm, and the bright colors seemed to fade a little. It was quite dark and cool when she crept under some leaves close to the stalk of a rose bush, folded her wings, and lay very still. Her wedding

day was over and she was a Queen. How shall we ever know what went through her ant-mind that night? Did she think and dream joyously of the day of freedom she has spent flying in the golden sunlight, and of her beautiful little lover; or did she remember how he had left her with a precious gift and how wearily she had wandered through the garden? Perhaps she felt afraid and lonely without her brothers and sisters, and the nurses and waiting maids who had taken royal care of her ever since she was born.

II

WINTER IN A CELL

In the morning, when the warmth came again, the Queen wakened and crawled to the edge of the leaf. The yellow light had come back to the garden but her wings did not eagerly spread themselves and lift her up. They were limp and weak. No little worker ants came running up to feed her honey-dew from their own hungry mouths. But, for the first time in her life she was not hungry. It was with a stern determination that she walked out from her hiding place and set forth again. Before long she stopped by a second rose bush and smelled the earth around it with her antennæ. Close to the base of the bush she found a stone half hidden beneath the grass, and she smelled and felt of it carefully. Then she began to dip the earth away.

She had never before used her fine, sharp-toothed mandibles but she went about her work with a craftsman's skill. She scratched the earth a little with her delicate fore-legs and then, opening her mandibles like a pair of saw-toothed tongs, seized bits of loose earth, rolled them into tiny pellets, and carried them away. Then she closed the tongs tightly to form a pointed trowel with which she began to scoop out a tunnel. She worked ceaselessly all the morning, never stopping for breath. There were hard sand grains and pebbles on which she dulled her delicate little tools, and tangled grass roots got in her way. She caught the tip of a wing on one of them and tore it half off, but she scarcely seemed to know it.

At last she found herself in a little, dark chamber not much bigger than she was, but safely concealed beneath the stone and having skilfully smoothed walls of warm earth. Her work was almost finished and she stopped to survey it. The little cell seemed perfect as she felt it over with her antennæ, and after a moment she

crawled to the opening. She rubbed her torn wings in a curious manner against the walls and jerked her shoulders, until one wing after another fell off, as if they had come unhooked. She looked at them in a satisfied way, with no sign of regret. She was fulfilling her instinct and the law of all queen ants. Then, with her worn and partly broken mandibles, she closed the tunnel leading to the sunlight and the bright garden and settled down in her tiny cell.

Here the young Queen spent the winter alone, in the dark, without food or water or fresh air; while many tiny eggs were forming and growing in her abdomen, fed by the fat she had stored up before her wedding and by her wing muscles which she was absorbing. During those long months perhaps she thought of her little King who had crawled away to die after their glorious wedding, or of her discarded bridal wings,—but I think she was only half awake, peacefully waiting for spring.

III

DWARF CHILDREN

When the spring came and the earth in the garden was warmed by the sun until the sap began to flow up from the roots and tiny, new grass blades shot up and unrolled,—the Queen seemed to come to life, too, and she paced up and down her cell. A few days later she laid a cluster of white eggs making, altogether, a pile no bigger, than a large pin head. She looked at them with great pride and licked them with her delicate tongue, and all day long she watched them. Sometimes she would turn them over and wash the dirt from each one, or carry them gently to another part of the cell. As the days went by the Queen grew thinner, but she never stopped caring for her eggs.

By the end of two weeks each tiny, oblong egg broke open and in place of the little white pile there were thirty white ant grubs, each one almost too small for you to notice. They were blind and without legs; but they had mouths and hard little black jaws at the pointed end of their long, ringed bodies, and their heads were always wriggling hungrily. Their soft, white bodies were supplied with tiny clumps of bristles and hooks. The Queen was very proud on the day when her first ant babies were born. Each grub had to be washed and brushed and carried about, and at the same time they must be fed constantly. This was the most wonderful

thing of all, for their mother had eaten nothing since she flew away from her city, and yet she fed each grub from her lips on food which her nurses had stored in her body half a year ago! It was a sweet ant milk, which the grubs ate hungrily and wanted more and more often as they grew. The Queen mother became thinner and thinner, but she delighted in watching her babies grow larger an fatter and more lively every day.

In three weeks each one was nearly an eighth of an inch long and the Queen's instinct told her that it was time to stop feeding them and put them to sleep. She loosened the warm earth on the floor of the cell and half covered a grub with tiny grains of it. Then the little blind creature who had neither hands not feet began doing a marvelous thing. It drew from its mouth a silk thread so fine that you could not have seen it, and slowly waving its head in every direction and curling its body back and forth, it proceeded to weave a silk cradle all around itself. It fastened some threads to the grains of earth, at first, to make a framework on which to weave, and before long it was enclosed and hidden within a little oblong cocoon of soft, tan-colored silk. Before it had finished, the Queen had half buried many of her other babies, and they had begun their cradle weaving. There were a few who were still hungry and these the mother kept feeding.

As each cocoon was finished the Queen carefully took away the grains of earth and washed it and carried it to one corner of the cell. By the end of the next day all her children were sleeping in a neat little pile where she had placed them; every now and then she would look them over and brush or wash them off, and then she would lie near them, half alseep. She was almost exhausted, nevertheless, for the two weeks that they slept she watched them and did not eat.

One day when she was washing the cradles one of them moved a little. She gently bit a tiny hole in one end, and a soft, limp antenna appeared. She made the hole larger with the help of eager little mandibles inside, and there crawled out a ver tiny, pale yellow, wingless ant. She greeted her mother joyously with her quivering antennæ and the Queen kissed and washed her soft, pale body. Though her mother was a Queen and her father had been a King, she was a worker who could never have wings or a wedding. She was also a little drawf, smaller than the workers in her mother's city; but her Queen mother was wonderfully

proud of her as the tiny creature ran gleefully about on her six new legs.

In a short time more than half of the babies had wakened and were growing strong and hard and darker brown as they ran up and down the cell, stroked each other with their antennæ, and let their Queen mother wash them. They were all dwarfs and workers with quick, eager little feet and slim bodies. It was time for them to begin their long lives of work and hunger. Their instinct taught them to make a passage-way from the cell to the open air, and some went off in the sunshine in search of food while others guarded and tended their worn out mother.

When one came in with excited sounds and gestures five of her sisters hurried with her to the end of the opening, and there was the huge, sleeping pupa of some beetle. They dragged it eagerly into the cell, and, cutting through its hard skin, went running to their starving mother with juicy morsels and crops full of insect blood which they fed to her. No feast she had ever eaten could have tasted half as good as this first one which her children brought to her after more than half a year of toil and fasting!

The stone by the rose bush was not disturbed by the gardener or the snow storms and rain. If you had chanced to sit near it ten years after the Queen hid beneath it you might have noticed groups of busy brown ants passing back and forth from under it. A great city had grown up there, with the old Queen for its ruler. She had never gone out into the garden again, but had been cared for and fed and protected loyally by thousands of her children, as she laid eggs year after year. Her first, drawf children had died, but she was still strong. Every August at that curious hour when some ant bell must have rung in the garden and all her royal children flew away, perhaps her old body was quickened by a swift, sudden memory of a flight in the sunlight with her sparkling King!

The Gentian

KATHARINE COVILLE WOODBURN
Washington, D. C.

HAVE YOU ever been walking in the country in late September and early October? It seems indeed, as if another year were brought to an end—even the staunch goldenrods and asters have become nothing but fuzzy balls of pappus and dry leaves. We have given up all hopes of anything new blossoming and have just begun to ponder on the evanescence of all kinds of life. And then suddenly we chance upon this—"—promise set 'mid fading," and the sequence of the seasons takes on a new meaning, and life is cheered by this plucky little Gentian. Bryant expressed our feelings in his lines "To the Fringed Gentian."

"Thou blossom bright with autumn dew,
And covered with the heavens own blue,
That openest when the quiet light
Succeeds the dim and frosty night.

Thou comest not when violets lean
O'er wandering brooks and springs unseen,
Or columbines, in purple dressed
Nod o'er the ground-bird's hidden nest.

Thou waitest late and comest alone,
When woods are bare and birds are flown,
And frosts and shortening days portend
The aged year is near his end.

Then dost thy sweet and quiet eye
Look through its fringes to the sky,
Blue—blue—as if the sky let fall,
A flower from its cerulean wall.

I would that thus, when I shall see
The hour of death draw near to me,
Hopes, blossoming within my heart,
May look to heaven as I depart."

The two best known Gentians are the closed or blind gentian and the fringed gentian.

The closed gentian gives the impression of an imperfect or incomplete flower, a flower checked in its development before it had reached the stage of opening its blue and white petals. The tall stiff plant is scarcely graceful. Its beauty lies in the hue of the

flowers, which is similar to the "Heaven's own blue" of the fringed gentian. The deep tinted flowers are firmly closed as though to protect the delicate reproductive organs within from the sharp touches of the late year. In this way also the precious nectar is guarded from pilfering wanderers. The large conspicuous blue or blue and white flowers remain apparently closed. At the tip of the flower are five short lobes which overlap leaving no opening—an ant could not pass. It would seem that it must be self-pollenated and we should wonder why the flower had developed so elaborately. But the bumble-bee can tell you better. She knows the secret combination which opens the portals of the flower. She visits the young flower, forces her way in where he can see white against the light blue background. And through this medium the gentian is cross-fertilized.

Sarah Day has a sweet conception of the closed gentian:

"Dame Nature lisped one day
To these closed buds some secret fair,
Then given earnest charge that they
Should keep her council with all care;
For ever since, they seem to say
Through pursed up lips—each purple bell—
Whate'er we hold of rich and rare,
We'll never tell, no never tell!"

It is always a temptation to gather gentians when we find them but it is a temptation which should be resisted, for not only does the spirit of their loveliness escape with imprisonment outside of their natural environment, but this beautiful flower is fast becoming extinct.

The gentians are found in shady places, along the banks of streams, though not in the water, but where tufted grasses are watered by threading springs that ooze up drop by drop and keep its roots moist. Our search for the plant is always attended by the charm of uncertainty, for being an annual, with seeds easily brushed away it often changes its haunts from year to year. So that it is quite a treat to find among the grasses one of these heaven-sent spots of azure.

The gentian is sometimes grown commercially. So bitter and tonic an element is contained in the roots that people have used it as a substitute for quinine. Through the mountains of the South the gentians are indiscriminately called Sawson's Snakeroot and the decoctions from them are taken in great doses as a remedy for dyspepsia and are favorably regarded as powerful tonics for

invigorating the system. It is used for horses also and made into powders. The negroes really believe it will cure snake bites.

The fringed gentian is the more beautiful of the flowers. It has not only the wondrous gentian blue which Thoreau describes as "such a dark blue! surpassing that of the male blackbird's back." but the open fringed petals add exceeding delicacy and grace to its splendor of color.

If the season has been a mild one we shall find perhaps a few blossoms lingering into November but the plant is probably blighted by a severe frost, although Miss Emily Dickinson's little poem forces another opinion:

"But just before the snows
There came a purple creature
That ravished all the hill;
And summer hid her forehead,
And mockery was still.
The frosts (?) her condition
The Tyrian would not come
Until the North evoked it
"'Creator! Shall I bloom?'"

The Deep Woods in September

Eva Marian Provost

Into the solemn mystery
One enters with softened tread;
No shaft of gold from opulent sun
May shimmer down thru tall trees dim.
No murmur of wind to listening leaves,
E'en phrasing of birds is stilled.
But flash! along the twilight way,
The aster lifts a beauteous ray;
A star from heaven in earth ta'en root.
Dogwood spreads its berries blue
Orchid gleams upon our view
In velvet leaf and lip of pearl
Toadstool eerie with cap for faerie
From soft brown mold looks through.
Fanciful ferns 'gainst gray rock leaned
Bunch berry in scarlet dreamed.
The soul of the wood in ecstasy stood
And shared with me its hour
Of peace and joy and rich content
On God's world of quiet power.

The Queer Performance of a Nuthatch

Mrs. Viola F. Richards
S. Deerfield, Mass.

Up under the eaves, on the south side of our barn is a bird-box which was made by hollowing out a short length of decayed oak log, boring an entrance hole, and putting on pieces of board for roof and floor.

During the winter, white-breasted nuthatches used this box as a store-house, and were frequently seen carrying in food, or bringing it out. That they used it also for a lodging place at night is very likely, as it is a habit of white-breasts to occupy such quarters.

One day early in April I chanced to look up at this bird-box, and my attention was attracted by the peculiar actions of a nuthatch which was moving rapidly about on the box, swinging her head from side to side, in what I took to be an endeavor to rid herself of a feather which appeared to be caught in her bill.

While I watched, she flew away, minus the feather, and I experienced a feeling of relief in her behalf.

In a few minutes I discovered her back again, going through the same performance.

With my curiosity now thoroughly aroused, I ran for my bird-glass, and watching through it, I found that the bird was actually sweeping her house all over, outside.

Back and forth over the top—paying careful attention to the corners and edges—and up and down the sides she ran, continually moving her head from side to side, with the white feather broom in her bill. Once she lost her hold on the feather, and it floated downward, but before it had gone far, she darted down, deftly caught it and resumed her work.

After several minutes of this activity, she was apparently satisfied with the result of her efforts and flew away.

The wind blew furiously, that day, and the air was full of flying dirt, but Mrs. Nuthatch must have been blissfully unconscious of the time and labor she was wasting. However, we judged that a subsequent inspection of the box caused her dissatisfaction, for next day she was seen doing her cleaning all over again.

Later, a pair of nuthatches nested in the box and raised two broods of young birds.

How to Study Ants in the Schoolroom

Very interesting stories may be read in the observation cage. To make this ant nest we must have two pieces of window-glass, ten inches square; a sheet of tin, eleven inches square; a piece of plank, one and one-fourth inches thick, twenty inches long and at least sixteen inches wide; a sheet of tin, or two thin, flat boards, five by ten inches in size.

Take the plank and on the upper side, a short distance from the edge, cut a deep furrow. This furrow is to be filled with water, as a moat, to keep the ants imprisoned. It is necessary, therefore, that the plank should have no knot holes, and that it be painted thoroughly to keep it from checking. Take the sheet of tin eleven inches square, and make it into a tray by turning up the edges three-eighths of an inch. Place this tray in the middle of the plank. Place within the tray one pane of glass. Lay around the edges of this glass four strips of wood about half an inch wide and a little thicker than the height of the ants which are to live in the nest; burnt matches serve very well for this. Cover the glass with a thin layer of fine earth. Take the remaining pane of glass and cut a triangular piece off of one corner, then place the pane on top of the other, resting upon the pieces of wood around the sides. The cover of the nest may be two pieces of tin, with handles soldered at the centers, or two boards with screw-eyes or knobs at the centers, with which to lift them. There should be a piece of blotter or of very thin sponge, introduced into the nest between the two panes of glass, in a position where it may be reached with a pipette, without removing the upper glass, for it must be kept always damp.

To establish a colony of ants in this nest we should proceed as follows: Take a two quart glass fruit jar and a garden trowel. Armed with these we visit some pasture or meadow near by, and find under some stone, a colony of ants which have plenty of eggs and larvæ. We scoop up carefully eggs, ants, dirt and all and place them in the jar, being as careful as possible not to injure the little creatures. While digging, we must search carefully for the queen, which is a larger ant and is sometimes thus found. But if we have plenty of eggs, larvæ and pupæ, the ants will become very contented in their new nest while taking care of them. After we have taken all the ants desirable, we place the cover on the jar, and thus carry them to the Lubbock nest and carefully empty the

contents of the jar on top of the cover of the nest. Of course the furrow around the plank has been filled with water, so the stragglers cannot escape. The ants will soon find the way into the nest through the cut corner of the upper pane of glass, and will transfer their larvæ to it because it is dark there. After they are in the nest, which should be within two or three hours, we remove the dirt on the covers, and the nest is ready for observation. But, since light disturbs the little prisoners, only one cover should be removed at a time and then for short periods.

Photo by Harry H. Knight

A Lubbock Ant's Nest with One-half the Cover Lifted

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

AN IMPORTANT STEP FORWARD

At the meeting of the General Federation of Women's Clubs, held at Hot Springs, Arkansas, in May, the following resolution was adopted:

WHEREAS, the boys and girls of today particularly need those studies that will develop individuality, strength of character and human sympathy; and

WHEREAS, one of the greatest aids in securing this result is a comprehensive study of outdoor nature and the natural resources of the land; and

WHEREAS, it is our belief that such study should be recognized as one of the serious subjects in the curriculm of the elementary school and that credit should be given as for other recognized subjects, be it

RESOLVED: That the General Federation of Women's Clubs express to the United States Commissioner of Education its belief in the value of such work, urge upon him to take definite steps toward formulating plans for putting the subject before the school authorities and guarantee to him its support in arousing public opinion.

The adoption of this important measure is largely due to the influence of Mrs. John Dickinson Sherman, well known throughout the United States as an authority and teacher of parliamentary law; she is a woman who believes in making her ideals realities,—with her to believe means to act. Her whole-hearted sympathy with the nature-study movement is a result of her observations on

the education of children rather than from her own great love of the out-of-doors. Aside from nature-study as an educational factor, she believes with some of the rest of us that the future agricultural development of our country depends upon a fundamental interest in the land and all that grows and lives thereon, and this can best be attained in childhood. In her opinion nature-study in the public schools is a war measure.

Dr. Elliot R. Downing attended the meeting and addressed the Federation, pointing out the importance of elementary science in our public schools. His address was the potent influence in bringing about the passing of this resolution.

The Federation of Woman's Clubs is a far teaching organization and if it will earnestly support the resolutions which it has passed, we may hope for a very needed reform in our public school curricula, and the results will be of the most vital consequence to our nation,—as Professor L. H. Bailey has said:

"If the farmer as he trudges down the corn rows under the June sun sees only clods, and weeds, and corn, he leads an empty and a barren life. But if he knows of the work of the moisture in air and soil, of the use of air to root and leaf, of the mysterious chemistry of the sunbeam, of the vital forces in the growing plant, of the bacteria in the soil liberating its elements of fertility; if he sees the relation of all these natural forces to his own work; if he knows of the hundreds of commercial products obtained from his corn or the animals that it fattens; he then realizes that he is no mere toiler; he is marshaling the hosts of the universe, and upon the skill of his generalship depends the life of nations."

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Teachers' Corner

How to Study a Composite Flower

Many plants have their flowers set close together to make a mass of color, like the geraniums or the clovers. But there are other plants where the flowers of one flower-head act like the members of a family, those at the center doing a certain kind of work for the production of seed, and those around the edges doing another kind of work. The sunflower, goldenrod, asters, daisies, cone-flower, and many other common flowers have their blossoms arranged in this way. Before any of the wild-flower members of this family are studied, the lesson on the garden sunflower should be given.

1. Note that what you call the flower consists of many flowers set together like a beautiful mosaic. Those at the center are called disk-flowers; those around the edges banner or ray-flowers.

2. Note that the flowers around the edges have differently shaped corollas than those at the center. How do they differ? Why should these be called the banner flowers? Why should they be called the rayflowers? How many banner flowers are there in the flower family you are studying? How are the banners arranged to make the flower-head more attractive? Cut off or pull out all the banner-flowers and see how the flower-head looks. What do the banner-flowers hold out their banners for? Is it to attract us or the insects? Has the banner-flower any stigma or stamens?

3. Study the flowers at the center. Are they open, or are they unfolded, buds? Can you make a sketch of how they are arranged? Are any of the florets open? What is the shape and the color of the corolla? Can you see the stamen-tubes pushing out from some? What color are the stamen-tubes? Can you see the two-parted stigmas in others? What color is the pollen. Do the florets at the center or at the outside of the disk open first? When they first open, do you see the stamen-tube or the stigma?

4. The flower-heads are protected before they open with overlapping bracts. As the flower-head opens, these bracts are pushed back beneath it. Describe the shape of these bracts. Are they set in regular, overlapping rows? Are they rough or smooth? Do they end bluntly, with a short point, with a long point, with a spine, or a hook? How do the bracts act when the flower family goes to sleep? Do they remain after the seeds are ripened?

5. Take a flower-head apart, and examine the florets. Can you see what part of the floret will be the seed? Is there a fringe of pappus above it? If so, what will this be on the seed?

6. Study the ripe seeds. How are they scattered? Do they have balloons? Is the balloon close to the seed? Is it fastened to all parts of it?

Our Trees, How to Know Them. Arthur J. Emerson and Clarence M. Weed, new revised edition, 295 pages, 149 illustrations. J. P. Lippincott. $3.50 net.

For several years the editor has used this book with great satisfaction when studying trees with her nature-study classes; it has the great advantage of showing the leaves, blossoms, and the fruit of each tree approximately natural size, and the form of the tree reduced, all made from photographs taken directly from the natural objects, a full page plate being devoted to each tree species. The text is clear, interesting, and to the point. In this new revised edition about twenty pages of new material have been added and eleven extra illustrations. It is a beautiful, useful and attractive volume and is a very practical aid to one who wishes to become acquainted with our native trees.

The New Voter. Charles Willis Thompson. 349 pages. G. P. Putnam & Sons. $1.50.

To the beginning voter, of which there will be many in New York State this fall, this volume will prove most enlightening. It is not merely a manual of civil government; in every chapter there is a keen discussion by two women, the husband of one, a politician and a Washington correspondent, the women asking the questions and the men replying according to their experience and ability. Every one of the twenty-eight chapters makes interesting and racy reading, being full to the brim of just the information which the new voter needs concerning the different departments of our government, and how they are actually, not theoretically, carried on. The book is certainly well fitted to do what its author hopes for in the Foreword: "This book is written for those who being new to the ballot wish to do their part to make politics good instead of bad." It is a volume that should be read carefully by every woman voter in this state before the 4th of November.

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THE
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The Gray Squirrel

ANNA BRISTOL
Ovid, N. Y.

The gray squirrels range from Florida to southeastern Pennsylvania, Hudson Valley, Indiana and Missouri. Where they are protected they will make their homes in the midst of any bustling community in some hollow log or tree. Here they will live and raise their families and lay up stores for winter, perfectly indifferent to the noise and crowds around them. When they live in the woods they must forever be on the alert to guard their hidden stores from the thieving red squirrels and ever keep listening for the fox's footsteps on the leaves or the distant scream of a hawk. The red-shouldered hawks are dangerous enemies and their hunting hours correspond exactly with the gray squirrel's working hours.

Often half a dozen or more squirrels will occupy the same hole and although the old males are apt to be unpleasantly ugly and tyrannical, the family seems to get along pretty well on the whole.

Gray squirrels warn each other of danger with a kind of flat, rasping bark, finally prolonged into a whining snarl, distinctly audible for an eighth of a mile or more. It is heard oftenest directly after a rain. The red squirrel is popularly supposed to drive away the gray variety and probably does to a certain extent, for he is pretty sure to attack the other on sight and generally comes out ahead, although an actual hand-to-hand tussle is of rare occurrence; the encounter generally consists of ill-natured bickerings at a distance of ten inches or more, terminating in the retreat of the larger of the combatants. It is said, though, that the gray squirrel when fairly cornered will usually succeed in putting the other to flight.

The numbers of gray squirrels have so decreased that in the last century and a half there has not occurred one of those great

squirrel migrations so common in the United States during the time of early settlers. Guided by some impulse, great hordes of squirrels congregated and marched across the country. The climatic conditions and food supply along the way lengthened or shortened these migrations. As the squirrels pushed blindly forward thousands perished by the way, and the survivors gradually spread over a great territory, until lost in the vast wilderness. Years might elapse before another great migration would occur over the same route, but there were the lesser migrations, caused by the failure of nuts in certain sections. So destructive were these migrations that we find on the statute books of many states rewards offered for each gray squirrel killed. The gray squirrel does not lay up such quantities of winter stores as does the chipmunk because he does not hibernate. However, like most of our other squirrels he has the habit of digging holes and hiding a nut here and there. It is probably his acute sense of smell more than memory that guides him to find these store places, hidden under the snow.

Dr. C. Hart Merriman says that gray squirrels are very fond of music, and that it affects them in a pleasant manner. They seem almost spellbound, and will sit bolt upright, inclining the head to one side, listening, meanwhile letting the forepaws hang listlessly over the breast, and turning the head around in a bewildered sort of way, and assuming a most idiotic expression.

The gray squirrel is rather sensitive to weather conditions and regulates his movements a good deal in accordance to the season. In summer he comes out early in the morning, spending the greater part of the day in concealment, to appear again for a few hours late in the afternoon. As the weather grows cooler in the autumn, he rises later in the morning and curtails his midday nap, so that after the first of November or thereabouts, the best time to find him is between ten o'clock and noon.

Gray squirrels are found in the hard woods, preferably hickories. Neither the hickories, chestnuts or beeches can be depended on to bear every year so that the gray squirrel population often drifts from one locality to another, assembling wherever food is most abundant and collecting all the nuts available, storing them in hollow trees and stumps.

When the nuts are finally all gathered, the gray squirrel spends most of his time indoors, coming out to enjoy the sunshine or to

bring some of his scattered hidden treasures to the home tree. In the winter often whole weeks go by without his poking his head out.

These squirrels sometimes make their nests in the branches of trees. While the leaves are still on the trees they cut off twigs and carry them to some convenient notch. To watch them construct the nest is very confusing. It seems as though they simply scramble over the mass, packing and entangling it together; there seems to be no special entrance; they just push their way into the center and escape wherever it is easiest to part the twigs.

The bushy tail serves as a balance and also as a parachute to this great leaper. When one falls, the legs are spread far apart and the loose skin over the ribs is stretched and flattened out. It would seem only a step from that condition to the parachute of the flying squirrel. The tail is also an object of great pride to the owner, as is shown by the abashed demeanor of the little animal when a portion of his brush is lost. Hiawatha gives him the name of Adjidaumo because of his frisky tail in the air:

"And the squirrel, Adjidaumo
Frisked and chattered very gaily,
Toiled and tugged with Hiawatha
Till the labor was completed.
Then said Hiawatha to him,
'O, my little friend, the squirrel,
Bravely have you toiled to help me;
Take the thanks of Hiawatha,
And the name which now he gives you;
For hereafter and forever
Boys shall call you Adjidaumo,
Tail-in-the-air the boys shall call you.'"

The first litter of young is seen in March in the warmer parts of the country and later in the more northern states. Mating is for only one season and during the time before the baby squirrels arrive the mother usually expels the male squirrel from the nest. The young are blind and helpless and remain in the nest for a month when they begin to awkwardly scramble about their doorway. At this age they have some very pretty little ways. Their chief characteristic is inquisitiveness. The world is so fine and new and there are so many wonderful things to see! Sometimes they will seem to clasp each other around the neck with their arms and will often scratch and stroke one another.

Gradually the young gain strength and confidence and it is then one can see how the liveliness of the young can surpass even

Have a Peanut!

From Country Life in America

the tireless activity of the older squirrels. Both old and young are exceedingly found of play and will often spring up from the ground as if in a high jumping match and turn regular somersaults in the grass. Sometimes they will catch hold of a branch hanging down almost to the ground and swing back and forth like boys who find a long grape vine in the woods.

No animal is more motherly than one of these parent squirrels and she takes great pride in the instruction of her nearly grown brood and no other squirrel is allowed to interfere in any way. She is very patient and will keep encouraging her youngsters gently.

The gray squirrel is not greatly in demand as a pet. He is so mischievious and tries his strong teeth on everything and damages things too much. He is not an affectionate animal. He will climb upon your shoulder and look for sweets but never curl up in your lap just for the pleasure of your companionship. He has not even monkey-like tricks with which to amuse you, nor a melodious voice to please your ear. His place is free in the great tree tops where he has room for his acrobatic feats, and where he can find a boon companion in every wind that blows.

"There can be no objection to the poetic interpretation of nature. It is essential only that the observation be correct and the inference reasonable, and that we allow it only at proper times. In teaching science we may confine ourselves to scientific formulas, but in teaching nature we may admit the spirit as well as the letter."

"The child should be set at those things that are within its own sphere and within the range of its powers. Much so-called nature-study teaching is merely telling the child what some man has found out."

"Thoroughness consists only in seeing something accurately and understanding what it means. We can never know all that there is to be learned about any subject."

"One is not superficial merely because he does not delve deep into subject-matter. He should try to be accurate as far as he goes."

—*L. H. Bailey.*

The Beech

PHEBE BIRD

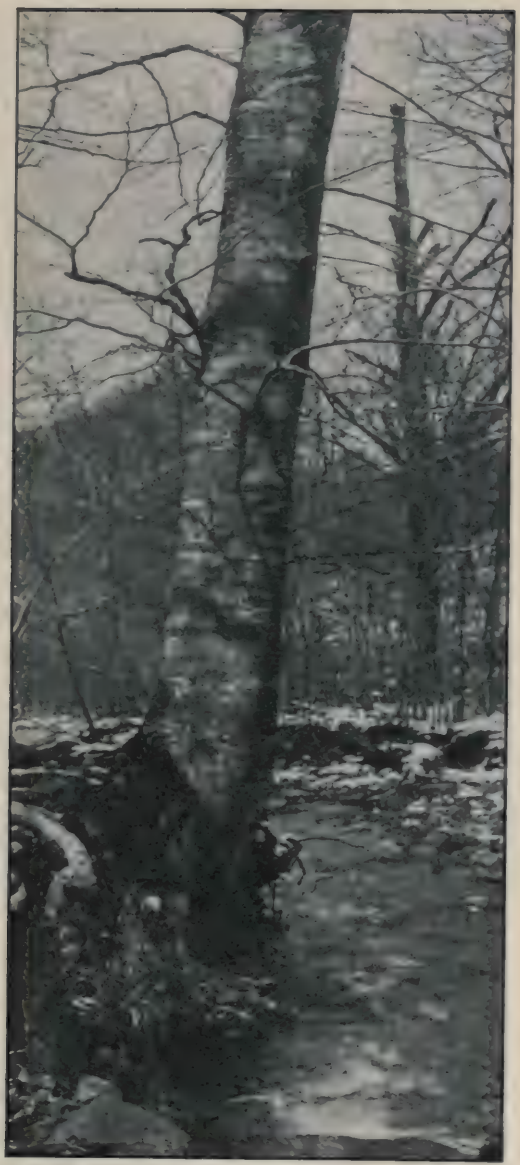
Its beautiful trunk alone is sufficient to identify the beech. No other tree is so smooth and round, and the quaker gray bark is unmistakable; it is often dappled in varying shades, but always gray and never marred by seams or corrugations. The bark is thin, hard, and closely knit, being less than a half-inch in thickness even on large trees. The slender, wide-spreading branches are also round and smooth and graceful but darker in color than the trunk, while the numberless small branches and twigs are darker still, those of the past season's growth being a glossy reddish brown.

The leaf-scars are alternate, but often the leaves themselves cling to the tree till late in the winter and can be studied nearly as well as in their summer greenness. They are very thin, smooth and silken, oblong, pointed, with very short stems, and stand out horizontally from the twig, so that it is no wonder that the beech in summer is the best of shelter, both in sun and shower; for its shade is very dense and it yields more slowly to the penetration of the rain than any other tree. The veins spring straight from the mid-rib to the small sharp teeth at the edge of the leaf. In spite of their delicate fineness the leaves are very strong and firm.

Often the four-lobed spiny burs cling to the twigs till late in the winter, and still show where the bases of the two triangular nuts rested.

The winter buds show just above the ring of leaf-scars, or the leaves themselves if they still remain. They are long, slim, smooth and pointed, their many scales very tightly folded, shining like silk, and of a lighter brown than the twig which bears them. Like all the rest of the tree they have an expression of delicacy and strength combined.

In the spring, the scales of the leaf-buds lengthen as they unfold and drop away, each leaving a tiny scar at the base of the shoot like the thread on a little screw. Within, each leaf has a pair of scales to protect it and these do not fall away till the leaf is grown but cling to the stem like brown needles. The new leaves are softly fuzzy on the ribs and under surface and seem to



The beech wears the crest of its nobility woven into the hues of its firm smooth bark.

have a fine fringe of hairs at the edge, but as they attain full size they become smooth and fine, like silk.

The blossoms of the beech appear in late April and May, the staminate ones growing below the leaves at the base of the new shoots and hanging in little balls of bloom on long slender stems. The pistillate flowers are on stiff, little stems near the ends of the twigs in the axils of the uppermost leaves. These are always in twos with triple parted, outstretched stigmas waiting to catch the pollen blown from the soft fuzzy dangling balls below. When the pollen is shed the staminate blossoms fall off, but the twin pistillate flowers grow into twin nuts protected by a spiny sheath and are little and brown, three-cornered and sweet and very "good to eat."

The very name of the beech family means "good for food" and is derived from the Greek verb to eat. The wild folk of the wood know the tree for a friend. In our northern forests its leaves furnish forage for the deer even in the winter and its fruit or "mast" helps them to grow fat in autumn; and the squirrels, mice, partridges, and jays are almost equally dependent upon it. The black bear loves the beech-mast and gorges himself eagerly before tucking himself away to sleep through the winter. "Beech-nut bacon" is said to be the best of all and droves of pigs are still turned into the beech forests of the Southwest where the tree is said to reach its tallest and finest growth. In Europe the sweet, three-cornered nuts are used for food and an oil is pressed from them for table use.

Beech wood is hard and heavy and durable under water, therefore, it is used for piles and for foundation timbers in damp places. It also makes an excellent fuel. Furniture, shoe-lasts and the wooden parts of tools are turned from the heart-wood.

"Let poets sing of their leafy trees
When the tides of summer fancies swell
And rock their thoughts, as a tropic breeze
Rocks the bee in a lily's bell;
But give me a harp whose ring is sharp
Tuned for November melodies,
That I may roam the bleak hills alone
And sing of the grey and leafless trees."

C. P. Cranch.

The Child That Needs a Nature-Study Teacher

"Good-for-Nothing Little Me"

FRANCES SHAW

O, good-for-nothing little me,
My sums I cannot do,
I'd love to please Miss Jones, you see,
I always smile when she looks at me,

* * *

There's a tiny bird in the apple tree
It's blue, it's blue, it's blue.

My Mother'll be so 'shamed of me
Why ever, I can't think,
I left my hat at home you see
And my curls are mussed as mussed can be,

* * *

There's something else in the apple treee,
It's pink, it's pink, it's pink.

The page? It's something—thirty-three,
I guess mine isn't right
I was drawing elves in my book, you see,
I couldn't hear when you spoke to me,

* * *

There's a cloud just over the apple tree
It's white, it's white, it's white.

I'm just as sorry as I can be,
I'm 'fraid you'll have to scold,
I learned the little poem, you see,
Instead of the words that begin with "t,"

* * *

There's a wonderful light in the apple tree,
It's gold, it's gold, it's gold.

Poor little good-for-nothing little me,
I've got to turn my back,
To shut them out and away from me,
Those lovely things in the apple tree,

* * *

And the mark that she has given me,
It's black, it's black, it's black.

The Strange Cliff Dwellers

PETER ANTONY MATTLI

Uri, Switzerland—now a volunteer in the American Army

There is a certain valley in the Alps of Switzerland, a strip of land surrounded by a chain of mountains; and one of these mountains forms a wall, which makes a sheer drop of some 1500 ft. to the fields below. Now this wall has been rent apart from top to bottom by some prehistoric convulsion or upheaval, forming a rather narrow but very deep and dark gorge or chasm.

Some years ago this abyss used to be the home of a bird of an enormous size, about whose identity then was a great deal of speculation and curiosity among the folks down in the valley. We often saw it during the summer evenings sitting up there on the cliff. It looked, for all the world like a great dog. Sometimes it would lift its wings, sail into space and disappear among the mountains on the other side. People who had been near it said, that it didn't make the least bit of noise when flying. To little boys it represented a real terror. They feared it very much partly on account of its weird call and partly also for the things that folks said about it.

Many of the folks insisted that it was a giant eagle and a gaint eagle, as all mountaineers know, is a rather serious proposition. It has a wing spread of 10 feet or more, and is therefore considerably larger than the condor, and though almost, if not entirely, extinct now, is still held responsible for many a crime; and according to good authorities, it deserves the blackest of reputations. These birds, so it is claimed, did a great deal of damage in their day. They carried off many a lamb and many a baby goat was lost in the mountains, never to be found again.

Not only did they carry off smaller game, but they also attacked larger animals that were too heavy to be carried off. Their method of singling out goats in the clefts and beating them down with their wings is well known. It is interesting to note in this connection that the goats know very well how to take care of themselves and usually avoid the bird by running together, forming into a solid bunch.

Now, of course, nobody knew for sure that the bird in the cliff was an eagle. There were people who maintained that he was not. They claimed that eagles do not fly noislessly, that they do not

go hunting in the evening and that the manners and tactics of this bird were altogether different from what they had observed in eagles.

The strange bird on silent wings therefore, became the object of considerable discussion as time went on. But however much opinions were divided in general, on one point everybody agreed: everybody felt that this bird was a robber and destroyer of the very worst kind. No wonder little goats disappeared mysteriously; cats left home never to return; and ever the mountaineer, who at two or three different periods during that summer went up into the higher mountains to count the lambs that in the meantime should have been born (we let our sheep run wild during the summer) reported that many of them, an alarmingly great number of them were missing; and all of these misdeeds, of course, justly or unjustly, were put to the account of the big stranger.

Thus the interest, curiosity and anger concerning him, became greater and greater as time went on and I felt that in the natural course of events, sooner or later the big stranger in the cliff was bound to get a visit from the otherwise peaceful and gentle mountaineers.

Fall arrived and with it the hunting season, and the hunting season brought a lot of hunters real and otherwise; hunters who knew the mountains by heart and were acquainted with the game and its habits; and hunters also who were more of the pseudo type; those perhaps who at some previous time had succeeded in killing or secretly buying a chamois and who now felt that the waning interest of their neighbors could only be kept alive by an addition of new laurels. And let me add right here that the second class of hunters invariably looked more like real hunters than the real hunters themselves. There was a freshmen-like touch about their appearance which might well have fooled the most unsophisticated minds. They had new rifles, new knapsacks, new goggles, the most modern field glasses and their boots were provided with iron nails and spikes ten times too big. They talked continually about hunting and hunting experiences. They had hunted, so they usually said, in the far off Tyrolean Alps and had also been in the Sarojen mountains where the king of all mountain game, the most rare and much prized steinbok (ibex) dwells. And really they hardly thought it worth while to honor our mountain valley with their presence. May I add, however, that most of the mountaineers knew better and that; I, in particular had very definite reasons for being skeptical.

To this class of hunters, the big stranger in the cliff seemed to fill the bill and now you could hear them talk it over in the evening in a low secret way. You could see them disappear the next morning at day break among the cliffs that lay in the direction of the chasm, only to come back empty handed in the evening and then talk it over once more and drink some more beer and wine and tell some more tales.

Thus the 15th of September arrived and nothing had happened as yet to the bird. Since this day and also the following two days were the occasion of a great celebration, the hunters suspended operations and joined in the merry throng. That 15th of September was a beautiful fall day; I remember it as if it had been yesterday. I can still hear the music float through the open windows and I can hear the echoes of songs and the shouts of children. Everybody was gay and happy; young folks danced and older folks talked and so far as the hunters were concerned, why — they really felt themselves a part of the event.

I, myself, was out among the rocks on the mountainside watching a couple of marmots build their winter home and carry in the hay necessary for the bedding. Now, as I watched them from behind a ledge (for they are very shy) I happened to glance over in the direction of the big chasm on the other side of the valley and the more I looked there, the more ambitious and restless I became. I saw myself climb up among the cliffs — surely I could easily make it! I would leave my shoes at home — climbing being easier without shoes. But what would my father say! No, I wouldn't do it,— having been expressly forbidden to use the rifle in any place except down in the valley. Still why shouldn't I do it, and who would know it? Weren't they all happy and, anyway, who would tell!

The more I thought of it the more tempting the proposition became, and so after some time, being a boy of slow but abrupt decision, I suddenly left my place (scaring the poor marmots almost to death) I climbed down the incline, trotted over to our house where the folks were dancing merrily, took the rifle and left, unnoticed, by the side door.

The climbing was somewhat tedious but using a roundabout way I finally reached the edge of that chasm from the upper side. I first looked down into it from the top and was impressed by the gush of air that struck my face; I then climbed down on

that same side to the next shelf some fifty feet below, where several mountain pines were, and there I found abundant proof to justify even our worst suspicions. Bones of all kinds were lying pell mell along the edge of the abyss. There were wings of partridges and ptarmigan, tails of cats, legs of rabbits with both skin and flesh on and an inumerable number of feathers of all kinds.

I looked down into the chasm but failed to see any thing indicating the robber's presence. I listened for some time and heard nothing but the music that came floating up from the valley below.

I now proceeded to climb to the shelf below, which I knew from a previous survey was the last one, the rock from others having fallen down. That shelf indeed was very narrow — I imagine it was hardly four feet broad but instead of dropping down like the edge of a table, it became inclined like a steep roof, the whole incline being formed by a somewhat coarse granite.

I hadn't even reached that shelf when I heard the well known sound; but to my surprise it didn't come from the gorge at all, but seemed to have its source right under that inclined rock-shelf, which to my great regret concealed the depth and consequently also the bird below. Again I heard the call and this time quite distinctly. I became all excited, forgot precautions and everything else and began sliding down in a sitting position with the rifle over my knees and using my feet as a brake (I was barefooted). The more I advanced the steeper the incline became and there finally came a point when the soles of my feet nor the seat of my pants seemed to have any seizing influence; and I think I might have tried to stop had it not been for another call that coaxingly came from below. This time I was mad! I forgot the incline and the wall and the danger and just kept on sliding down over the rock shelf and suddenly came to a stand-still at its lowest edge, owing to a little projection about one inch high. And then what do you think I saw — the valley? No! It was there but I did not see it.

I saw one thing only and that was the big bird. It was sitting on the stump of a mountain pine, a mountain pine that had grown in a shelf about two feet broad and about fifty or a hundred feet below where I was.

I aimed, fired and missed. The bullet struck some feathers out, it is true but the bird was not seriously hurt, for, slowly

and deliberately, it lifted its wings and silently it sailed away, to my very great regret.

But what do you imagine I saw next or almost at the same time! Why there was another bird of exactly the same kind sitting on that very same shelf and just lifting its wings to fly away. I lost no time nor did I fail to correct my first mistake of aiming too high. I aimed fully two inches further down, fired and, oh joy, down it fell, a dead and lifeless body, now striking the wall, now falling free, now striking it again, then falling free—growing smaller and smaller until it reached the floor of the valley when it looked like a mere speck.

How happy I felt! Surely this was more fun yet than when I got the marmots for the strange hunter, for this time it was my game and I was not under obligation to keep a secret.

By the time I reached home it was night and owing to the celebration I found a ready audience; the people looked at the bird that hung over my shoulder, wonderingly; and many a flattering comment was made by the mountaineers on my adventure, and what boy wouldn't like such comment! But the joy of the event was marred by jealously. That second class of hunters, of the very type who never refused my help when I met them in my ramblings in the more lonesome regions of the alps, now cast ominous looks at my prize. Why, the very idea of permitting a boy under age to mix in grown up peoples business! He didn't even have a license and really who gave him the right to carry a gun and endanger honest people's lives! The more they talked the more excited they became. Their faces grew red with anger, their voices loud and hoarse and I for my part actually wished that I had never set eyes on the bird. You must remember that the hunters were half drunk and not at all of the gentle type of folk.

Of course I felt deeply disappointed and crestfallen at this ungenerous attitude; but my father said that I shouldn't worry, because birds which had robbed the people deserved to be killed, license or no license, and anyway even if they should tell the police, the latter would hardly think it worth while to climb up into our valley to investigate. Besides these comforting words of my father I felt I had the moral support of the mountaineers who greatly appreciated and approved of my adventure, so it came out all right in the end and the episode has proven to be one of my most interesting memories of my boyhood.

The Eagle Owl of Europe

(Evidently this is the bird described by Mr. Mattli in the previous article.—*Editor.*)

The Great Owl or Eagle Owl, as it is often called, inhabits the northern part of Europe, being especially common in Sweden, Norway, Switzerland, and Russia, and being found even in some parts of Italy and Turkey. Although seemingly exceeding the golden eagle in dimensions, the Great Owl is in reality a very much smaller bird, owing its apparent magnitude to its feathers and not to its body. The length of this fine bird is rather more than two feet, and the aspect of its outstretched wings is wonderfully magnificent. The general color of the Eagle Owl is brown, mingled with a yellow tinge, and covered on the upper surface with bars, dashes, and streaks of blackish-brown. The long armed claws are black, and the beak is also nearly black. The eyes are of a bright radiant orange, and have a very fierce appearance when the bird looks the spectator in the face.

The food of this Owl consists generally of grouse, partridges, hares, and other similar game, and the bird is so powerful that it will successfully chase even larger prey. Mr. Lloyd, in his well-known "Field Sports," gives the following description of the Eagle Owl as it appears in the Scandinavian forests.

"These Owls, Dr. Mellerborg assured me, will sometimes destroy dogs. Indeed, he himself once knew an instance of the kind. He states another circumstance, showing the ferocity of these birds, which came under his notice. Two men were in the forest for the purpose of getting berries, when one of them happening to approach near to the nest of the Owl, she pounced on him while he was in the act of stooping, and fixing her talons in his back, wounded him very severely. His companion, however, was fortunately near at hand, who, catching up a stick, lost no time in destroying the furious bird.

"Mr. Nilsson states that these Owls not infrequently engage in combat with the eagle himself, and that they often come off victorious. These powerful and voracious birds, that gentleman remarks, occasionally kill the fawns of the stag, roebuck, and reindeer. The largest of the birds common to the Scandinavian forests, such as the capercali, often become their prey. The hooting of these Owls may often be heard during the night-time in the northern forests; the sound, which is a most melancholy one, and which has given rise to many superstitions, is audible at a long distance."—*Extract from Wood's Living World.*

The Oaks

MARY E. DONAHUE

Penn Yan, N. Y.

"I am the type of strength and steadfastness.
The man who measureth by me his might
Howe'er so fierce may prove the conflict's stress
Will ever stand unvanquished in the fight."
C. Scollard.

"The oak is the most majestic of forest trees. It has been represented as holding the same rank among the plants of the temperate hemispheres that the lion does among the quadrupeds, and the eagle among birds; that is to say it is the emblem of grandeur, strength and duration, of force that resists as a lion is of force that acts."

—Loudon.

The oaks are divided into two classes, the white group and the black oak group. In the white oak group, the leaves have rounded lobes and are rough and light colored below, the wood is light colored, and the acorns have sweet kernels which mature in one year, so that there are no acorns on the branches in winter. To this class belong the white, post, bur, swamp white, chestnut, yellow and chinquapin. Of the black oak group, the leaves are nearly as smooth below as above and have angular lobes ending in sharp points. The bark is dark in color. The acorns have bitter kernels and require two years to mature, so that they may be seen on the branches in winter. To this group belong the red, scarlet, black, Spanish, pin, bear, black jack, shingle, and the willow oaks.

There are many marked resemblances in the oak family. The bark of every species is heavily charged with tannic acid. The roots take hold of the earth in two ways: a strong tap root goes down deep into the ground, and at the same time wide spreading horizontal roots keep near the surface. The leaves vary in form. The character of the inflorescence is the same in every species. The stamens and pistils are separated, borne in different flowers, but both kinds of flowers are produced on the same branch. These appear together just when the leaves are half grown. There is no corolla. The calyx is bell-shaped and divided into four to six divisions. The four to six stamens have protruding filaments and oblong two-celled anthers.

The ovary is inferior, incompletely three-celled and inclosed partly by a growing scaly involucre, which in time develops into the acorn cup. The styles are usually three. There are two ovules in each cell, but all save one fail to be nourished. The nut is a fruit formed by the adhesion of an ovary to the calyx and matures either the first or second year, and is always more or

Red Oak
Acron large with shallow cup

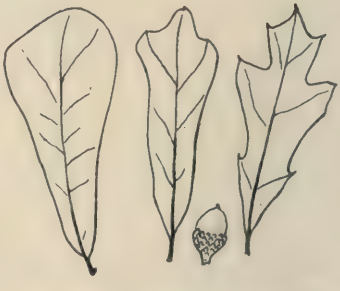
Scarlet Oak

Pine or Swamp Oak

Black or Yellow Oak
Two types of Black Oak leaves

Shingle Oak

Spanish Oak



Water, Duck or Possum Oak

Black Jack
Grows on dry sandy soil

Bear, Barren or Scarlet Oak
Usually along coast or sandy barred

Willow Oak

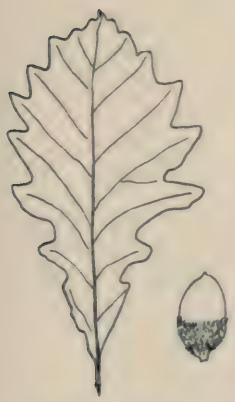
less surrounded and inclosed by the cup. The acorn cup is of woody texture made up of a large number of tiny scales which have grown together, sometimes entirely, sometimes with free tips. The seed fills the nut.

The oak is long lived and does not produce acorns until about twenty years of age and requires a century to mature.

Oak wood is usually heavy, very strong, tough and coarse. Hercules carried an oaken club. The ancients made oaks the

White Oak

Scrub Chestnut or Chinquapin Oak
Usually a shrub



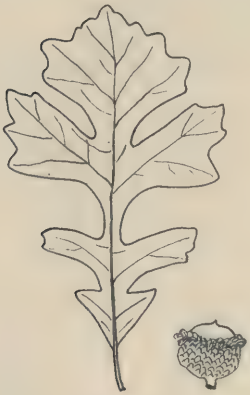
Swamp White Oak

Chestnut, Cow, Basket Oak

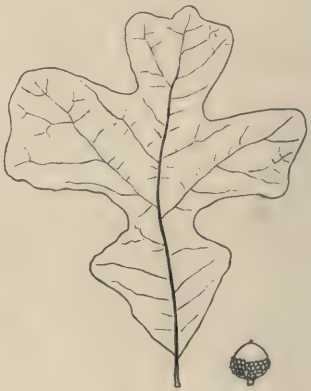
Chestnut or Yellow Oak
Leaves very much like those of the Chestnut except the lobes are more rounded

object of love and reverence and also attributed to them the mystic power to foretell or advise about coming events.

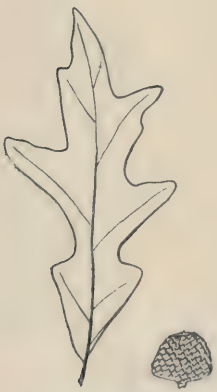
"It seems idolatry with some excuse
When our forefather Druids in their oaks
Imagined sanctity." —*Cowper.*



Bur or Mossy Cup Oak
Cup of the acorn fringed



Post Oak



Overcup Oak
Cup completely covers the acorn

Live Oak

One was admonished in an approaching storm to

"Beware the oak, it draws the stroke."

It is also associated with the ash in country proverbs:

"If the oak is out before the ash,
'Twill be a summer of wet and splash;
But if the ash is before the oak
'Twill be a summer of fire and smoke."

There are no records of long life in America, but there are oaks in England which are believed to have been old trees in the time of William the Conqueror. Pliny mentions an oak which was an old tree when Rome was founded and which was still living in his time. In the United States the largest specimens are found in the Mississippi Valley. The famous Wadsworth oak, with a circumference of twenty-seven feet stood for many years on the bank of the Genesee River, about a mile from Geneseo. But this circumference is small in comparison with some of the European oaks. The Cowthorpe tree is seventy-eight feet in circuit and is at least eighteen hundred years old. Another in Dorsetshire is of equal age. In Westphalia is a hollow oak which was a place of refuge in the troubled times in medieval history. The great oak at Saintes in southern France, is ninety feet in girth, and has been ascertained to be two thousand years old. It commemorates a period which antedates the first campaign of Julius Caesar.

Then there is the Parliament Oak, so called because it is said that Edward I, who ruled from 1272–1307 once held Parliament under its branches. It is supposed to be fifteen hundred years old.

"An unremembered Past
Broods like a presence, mid the long gray boughs
Of this old tree, which has outlived so long
The flitting generations of mankind."

The oak appears early to have been an object of worship among the Celts and ancient Britons. Under the form of this tree the Celts worshipped their god Tueb, and the Britons, Tarmawa, their god of thunder. Boal, the Celtic god of fire, whose festival (that of Yule) was kept at Christmas, was also worshipped under the oak. The yule log was always of oak.

"Criminals were tried under an oak tree; the judge with the jury, was seated under its shade, and the culprit placed in a circle made by the chief Druid's wand. The Saxons also held

their national meetings under an oak; and the celebrated conference between the Saxons and the Britons, after the invasion of the former, was held under the oaks of Dartmoor."

"The Briton has but one native oak on which to spend his loyalty and devotion. We have fifty kinds — All American — but the White Oak is chief among them all."

Two Sonnets

By William Prindle Alexander

Before Dawn on Mount Buell

A Peak in the lower Adirondacks

Oh! hour full-charged with mystic sound and light,
A sanctifying hour; the art of day
Still gives no sign, and the weird spell of night
Reigns on. A prescience of the gray
Moist morn is tokened in the measured song
The wood thrush has begun, how like a bell
His ringing tones are borne, how clear and strong
They thrill the grateful calm; a sylvan spell
Is instinct in these dew-washed wooded ways
Where scarce a leaf stirs on the mountain top:—
Yea, in this hour the peace of primal days
Seems native; lo! and now the shadows drop
Like dusky curtains, night is fairly done,
For in the east a million-petaled rose
Is blushing on the distant peaks; the sun
Too soon will come to break the deep repose
Of these majestic mountains:—truly I
Have felt a tranquil Presence potent here,
Vast as the night and silent as the sky,
Yet in this forest, Ah! how very near!

To the River of St. Johns

Great rivers flow that oft entrance the eye,
And many lordly streams my eyes have seen,
The Rhine's proud flood, the Hudson's magic sheen,
And lovely Avon, mirror of the sky.
But thou! oh river, beautiful St. Johns,
Banked by the palm, thy waves glide slowly by,
And on thy bosom, boats like stately swans
Move on, where oaks in rich reflection lie:
Draped by the pendant moss, each noble stem
Grave beauty lends to thee, Oh! mystic stream,
And hyacinths that eveywhere begem
Thy course, are mingled with thy native gleam:—
Each day flow on, thy sun-blessed charm renew,
The ancient beauty that DeLeon knew!

The White Oak

MARTHA QUICK
Teacher in Rural Schools

The White Oak is well called "The King of Trees." It is the noblest among the fifty species of Oaks found in America.

Since earliest time it has been regarded as a symbol of strength, dignity and independence. Writers and poets of all ages have found in it this quality. The Druids chose this tree as protection for their ancestoral-fire worship. These lines of Virgil seem to show the ancient feeling towards this tree.

"Jove's own tree
That holds the woods in awful sovereignty
The length of ages last his mighty reign
And lives of mortal men contend in vain
For in the midst of his own strength he stands;
Stretching his brawny arms and leafy hands,
His shade protects the plains, his head the hill commands."

Since early childhood I have selected special trees which I have called mine. They were to me, as playmates, or friends. Sometimes they were afar off on the horizon or across the fields in the meadows or near by home, as the old apple tree with its friendly humps which served as steps. The one tree which seems the grandest and best of all is a great white oak. It stands on the top of a high hill, looking over the slope of forest below it and across the valley to another tree-covered slope

We wonder about the history of these great trees. We have no record but the story which the tree tells us. This tree is about one hundred feet tall. The branches do not come out below the height of about fifty feet. It stands where there was once a forest. This high branchless pole shows its early life in the forest, how it grew upward stretching its branches toward the light. Later when the forest was cleared away it extended its great arms in all directions. As most oaks require a century to reach maturity this particular tree must be at least two hundred years old. It is believed that many species reach a great age, perhaps one thousand years. The famous Charter Oak of Hartford was believed to be several hundred years old.

The bark of the white oak is light gray with spots varying to darker or white. It is scaly but not deeply fissured. The branchlets are a light green but later become darker green and

finally grey. The leaves are easily distinguishable from those of any other group of trees by their deep-rounded lobes from seven to nine in number; the sinuses are usually deeper and more rounded than in other oaks.

The buds form in the fall and remain on the trees all winter. They are reddish brown, somewhat pointed. Early in May the buds burst and slowly the leaves unfold They are first bright red above and pale below, soft and downy as they droop from the twigs. Soon they become silvery, greenish white. "When the leaves of the white oak are the size of a squirrel's ear, then it is time to plant our corn." Thus the Indians told the Pilgrims as they taught them to plant the corn. When the leaves are full-grown, they are thin, bright yellow-green above, and pale and smooth below. In the late autumn they turn a deep, rich red and remain on the trees long after other leaves are gone.

White Oak in winter
Drawn by W. C. Baker

Often on young trees they remain all winter.

When the leaves are about one-third grown the flowers appear. The staminate or pollen-bearing flowers hang in several strings, like beads from the twig. They are fuzzy and bright yellow. The pistillate flowers, which are not so noticeable are borne at the axils of the leaves.

All are familiar with the fruit of the white oak. Squirrels and other animals are fond of their sweet kernels. I remember gathering large stores to be made into cups and saucers for the playhouse. Their peculiar shape, the smooth round apex, bright and shining which is fitted so well into a rough and scaly cup is delightful to look at. As the oak begins to bear fruit at the age of twenty years, many acorns are produced during its life and fall to the ground and are left to care for themselves.

This small acorn which possesses all the strong qualities of the mother tree does not wait to dry up or crack open as do the hickories or walnuts. It bursts its hard shell and sends its strong tap root deep into the ground. In spite of grass or forest litter it will manage to grow a short stem with a few leaves the first season while the root will go deeper and deeper thus beginning the root system which will later form a great part of the full-grown tree. The oak roots extend far down into the sub-soil gathering food materials for the tree growth, while near the surface many spread horizontally, and give the tree its strength and poise.

The Eastern white oaks grow well in many soils, it is found chiefly in north eastern United States. Some specimens have reached their greatest size in the Ohio Valley. This species is fast disappearing from our forests. Its seeds are so often lost and seedlings grow very slowly. The high value of its wood has caused many a great oak to fall. The lumber is very strong and durable, beautifully grained and firm. It is used for many purposes as furniture, cars, wagons, and interior finishing. Its bark contains a large amount of tanin which is used in the production of leather.

The oak does not live for itself alone but is a host for a number of species of insects. A single oak may harbor 500 different kinds, among them many gall makers.

The Red Squirrel

ALFRED EMERSON
In machine gun corps U. S. Army

About the most commonly seen wild animal in our northern rural districts is the red squirrel. This spry little adventurer is often seen climbing trees, running along the branches and jumping from one tree to another in a graceful manner. Often one wonders how it is possible for him to be so sure of his jump, because often he jumps upon twigs which swing way down with his weight. Once, however, I did see a squirrel fall. As I was walking I passed near a vine-clad building and I heard an awful chatter in the vines far above me and I looked up just in time to see a red squirrel fall from the gutter. I don't know how he came to lose his balance, but in touching the ground, he certainly regained it remarkably quick, because all I saw was a brown streak extending from the spot where he fell and vanishing around the corner of the building. Some authorities claim all squirrels, in some manner, are able to break their fall by forming a sort of parachute of their body and tail. They have even been known to escape enemies by volplaning to the earth. I have never noticed this action among the red squirrels; however, connected with this habit, the squirrel's tail forms a valuable aid by guiding him in his flight whether it is simply jumping from one tree to another or actually planing to the ground. The flying squirrel is, of course, better adapted to this form of locomotion than the red squirrel, but I doubt whether any of our squirrels would injure themselves by attempting to jump from a too great altitude.

The red squirrels are found commonly in mixed woods of oak, maple, hemlocks, beeches and chestnuts. Here they are always happy, and in any season may be seen busily gathering their food. If they come upon you unawares they often become quite angry and will chatter and scold, moving the tail and body in accompaniment as if the whole mind was filled with anger at the contemplation of a thing without even any kind of a tail, interfering with them. The red squirrel does not lay up stores for the winter in the same way as some of his cousins, the chipmunks do. He is always about, in all weather, hunting for food, in hemlock, pine and sumac panacles. Sometimes he will place nuts at different

parts of a tree, such as the crotch of some limb, but they never remain there long.

The red squirrel is a great thief and often makes way with stores collected by the chipmunks, gray squirrels, mice and blue jays. He often robs birds' nests and does a great deal of harm to these because of this habit.

The red squirrel nests are often in holes in trees but are also found outside, consisting of grasses, leaves, etc. During April the young are born and there are usually four to six in each litter. Few enemies disturb the red squirrel, hawks and owls being among the worst.

In the summer the red squirrel is reddish brown. During the year he sheds his fur twice, and in winter he is much duller and the red is not so conspicuous. He is whitish beneath; in winter this turns to a brownish gray.

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The Tree Friends of James Russell Lowell

Effey L. Riley
Rochester, N. Y.

James Russell Lowell had many friends. He began making friends when a very little boy and he always kept his friends. In college, later when he began his writing, as a professor, editor, and diplomat, he had many friends. Among them were the best men of the times in America and in Europe. His writing brought him in contact with such men as Poe, Longfellow, Nathan Hale, Hawthorne, Whittier, Story and Dr. Parsons. As a scholar he had many friends in England and on the continent, where the best universities paid him their highest honors.

To-day the writings of all great men are studied and searched through in the most careful manner to find out all the intimate things concerning the lives of the authors. In the reading of Lowell's poems one comes quite unconsciously to feel his love of nature and to see her with his eyes. In spite of the fact that Lowell was a man of the world with a rich full life we feel that he is at his best when writing of those things he knew best in nature. His whole writing is enriched more by its homely New England background than by all his European polish. It is in the familiar New England woods that Lowell found his best friends. He writes of the trees

"These were my earliest friends and latest too"

He calls to them

"O never unsympathizing trees."

Or he says he is —

"A willing convert of the trees."

He knew his trees too, as one can only know those things that are best loved.

"No distant tree but by his shape was known,
Or, near at hand by leaf or bark alone."

One of Lowell's earliest poems, which he inscribed to his mother was about the old chestnut tree that stood beside his home at Elmwood, Cambridge, Massachusetts. Under this tree he played when a boy, and one feels that he is refering to it again in his "To the Dandelion."

"The sight of trees calls back the robins song
Who, *from the dark old tree*
Beside the door, sang clearly all day long."

He knew his friends in all moods, seasons and places, a study of his descriptive words clearly brings this out; such examples as follow will illustrate a few. 'Bleak pines;' 'Wind vexed woods;' 'filmy trees;' 'wooded shores;' 'like a strong oak;' 'the poplars shiver;' 'pine trees moan;' 'elm trees heavy shadow;' 'elm leaves dark and dewy;' 'where, at their shades shy aspens look'. There are countless others, every page of his poems, with the exception of the Biglow Papers, yield some example.

Each tree is for him quite distinct, they are quite as separate and with as much character as his human friends. The oaks are no more just oaks than Smiths are just Smiths. They are swamp oaks, red, white or scrub each with definite characteristics setting them off from others of their family.

"The swamp oak with his royal purple on."

"The red oak, softer grained yields all for lost
And with his crumpled foliage stiff and dry.
After the first betrayal of the frost,
Rebuffs the kiss of the relenting sky."

The trees most often mentioned are, birch, pine, fir, hemlock, maples, buttonwood, chestnuts, cedars, lindens, elm, willows, poplars, aspens, apple and sumach; all of them are found commonly in New England woods. It seems a little strange that no mention is made of the larch tree. Lowell must have known the larch as it is found in New England. His good friend Longfellow uses it in his poems. Maybe Lowell disliked it as Wordsworth did and simply failed to mention it either way out of kindness to the tree family as a whole.

Many of the trees Lowel has treated with separately as Wordsworth did so many of the flowers Lowell has written poems on several separate trees describing their moods, habits and character. These are found under the titles of "The Oak," Th Birch," "The Maple," "To a Pine Tree." In other cases he has used a tree to carry out some analogy such as in his poem "Tree Growth of the Legend" he shows how a legend grows as does a pine tree from a small slender shoot to full grown.

'So, pine-tree, the legend grew strong-limbed and tall'

Later in the same poem he writes

'Yes, the pine is the mother of legends;'

Another time when asked to write a poem for the 100th anniversary of Washington's taking command of the American army at

Cambridge, Mass., 3d July 1775, he calls his poem "Under the Old Elm" for he says

"What landmark is so congenial as a tree."

And he uses the old elm under which Washington stood

'Beneath our consecrated elm
A century ago he stood,'

to illustrate all the passing history as a mark and starting place.

Maybe Lowell best expresses his love for trees in "Under the Willows." Who can doubt his feeling when they read,

'I care not how men trace their ancestry,
To ape or Adam; let them please their whim;
But I in June am midway to believe
A tree among my far progenitors,
Such sympathy is mine with all the race,
Such mutual recognition vaguely sweet
There is between us. Surely there are times
When they consent to own me their kin,
And condescend to me, and call me cousin,
Murmuring faint lullabies of eldest time
Forgotten, and yet dumbly felt with thrills
Moving the lips, though fruitless of all words.'

Or speaking of them quite as friends again —

'And I have many a life long leafy friend
Never estranged nor careful of my soul,
That knows I hate the axe, and welcomes me
Within his tent as if I were a bird
Or other free companion of the earth,'

Such examples of his intimate feeling and knowledge are found throughout his poems.

Some descriptions of trees bring quite definite pictures to mind and we can see as Lowell saw, as he wrote, the very trees in their native surroundings. The following word picture of the birch is a vivid example,

"The birch, most shy and lady-like of trees
Her poverty, as best she may retrieves
And hints at her forgone gentilities
With some saved relic of her wealth of leaves."

It is interesting to note the use of pronouns "her" for a birch, slender and white, but for a gnarled old oak it's "he" or "his." Other descriptions are quite as intimate, his poems are full of them. To really know and love the trees as Lowell did one must know first the trees and then read Lowell with the trees in mind. Then the poems have a new meaning and Lowell himself becomes not James Russell Lowell, poet and diplomat; but the lover of nature and all out-of-doors and above all, Lowell your friend.

The Chipmunk

Elsa Allen
Ithaca, N. Y.

There is no more beautiful little animal frisking along fences and hedgerows and scrambling through the woods than the chipmunk. Its fur is fine and wonderfully soft and pleasing in color, rich shades of brown, chestnut, buff and black melting and blending on his striped back. It has the pointed head, long body, and short legs characteristic of the rodents to which order of mammals it belongs. It is not a climber like its cousins the squirrels and therefore does not need such a large bushy tail for steering. Sometimes, however, the chipmunk runs several feet up the trunk of a tree, especially when frightened and far away from its burrow.

The chipmunk which we have in central New York is *Tamias striatus* but farther north it is replaced by a very similar more light colored species, *Tamias striatus lysteri*. There are numerous species of chipmunks through western United States and in some localities these little creatures are considered quite a nuisance because of their damage to corn. Here in the east, however, the chipmunk is harmless and is a most enjoyable little tenant of our gardens. It feeds on nuts, berries and grains and frequently will come to a feeding station and sit for quarter-hours at a time stuffing its cheek pouches full of grain to tide over the winter.

When the cold November days set in, the chipmunk disappears into its winter quarters beneath the ground, which it has elaborately made ready for hibernation. It always has an underground home to which it can dart when the hawk or fox is about, and in the fall it spends the entire time filling the burrow with food perhaps scattered about the edges of its grassy bed or neatly stored away in galleries above the nest.

The burrow is quite elaborate. A site under cover of a stump or stone is usually chosen so that the entrance will be inconspicuous. The door is then made just large enough for the chipmunk's slender body to pass through but after descending a few inches it suddenly widens and sinks perpendicularly in several feet; it then proceeds horizontally a couple of yards, then rises slightly to a roomy chamber carpeted with soft grass. There

is usually a back stairway giving a quicker, more direct access to the outside.

The amount of earth which must be removed from such a subterannean house is a good deal for so small an animal to manage and one would suppose that traces of it at least would be visible at the entrance. But not so. Every bit of it is carefully carried away and the only way he could accomplish this is by means of his pouches.

To such a sun-loving merry creature as the chipmunk, it must be a great change to live in the dark earth; but since he is entirely terrestrial in his feeding habits it is necessary that he should hibernate while his food supply is covered with snow.

Unlike many of the small hibernating mammals, the chipmunk becomes only comfortably fat in the fall — his sleep is not so profound and he frequently wakes up and partakes of his food stores while waiting for spring.

The chipmunk is one of the first signs of spring coming, out sometimes in March and the first one to see his little striped form slipping along the rail may feel that winter is over.

Photo by Verne Morton

The Eastern Chipmunk

The Pig

HELEN E. MURPHY
Phoenix, N. Y.

THE wild hog that once roamed over Eourope, Asia, and Africa, is the ancestor of our common domesticated pig. It likes situations where it may wallow in the water and mud; but it also likes to have, close by, woods, thickets, or underbrush, to which it can retire for rest, and also when in danger. The wild hog is extremely active and powerful; it is fierce and dangerous, particularly when old. Iron gray or dirty brown in color, spotted here and there with black, it is well concealed in the underbrush, and the thick skin covered with stiff bristly hairs is a fine protection from thorny thickets. When excited or angry, these bristles rise and add fury to its appearance. Twilight, night and early dawn are its favorite times for feeding upon plants, fruits and roots, and also for sport, for fighting and for adventure. Provided with a bony, wedge-shaped head, a snout that is pointed and also the seat of a highly developed sense of smell, an upper jaw armed with slashing tusks, a neck that is long and muscular and loins broad and strong, the wild hog is excellently adapted to look out for itself.

Hunters of wild hogs declare that they are full of cunning and strategy; and we must admit that the domesticated pig of today is very clever; all it needs is a chance to give evidence of it. With an affection that causes it to follow a person like a dog, and a memory that he can be trained to play Yankee-doodle on a violin, we must admit that the pig has brains. The trouble is that most of the time it is so stuffed with fattening food that no opportunity is given it to use his brains, except once in a while when it squeezes through the fence, and then how vainly we strive to get it back! Then it remembers to forget everything, especially the situation of the hole through which it escaped.

By nature, the pig is very neat; but since it has come in contact with civilization, it rarely gets half a chance to show this quality. Sparsely clothed with bristles and hair, flies and other insects bite it unmercifully, and it has to wallow in the mud to rid itself of these pests; but this wallowing is in the nature of a mud bath, repeated only at intervals.

The pig has a most unique and beautiful digging apparatus happily placed on the end of its nose, where it is backed by all the pushing power of a stout body, and where it is directed into operations by the aid of very keen olfactories. This is a most efficient equipment for digging. If anything good to eat is buried in the earth, trust to the normal pig to find it. But alas! When a little bit of metal ring is thrust into the sensitive base of the "rooter," this beautiful contrivance fails to operate; his pigship is reduced to the common level of all mammalian kind, and he is left endowed with only his appetite.

When allowed to roam in the woods, the pig lives on roots and nuts, especially acorns and beechnuts. In the autumn it becomes very fat. In the wild state this was evidently a provision of nature for the hardships of winter. It is this characteristic that makes the pig useful for food.

The domesticated pig is well fitted for locomotion on either wet or dry soil, for the two large, hoofed toes enable it to walk well on dry ground, and the two hind toes, smaller and higher up, help to sustain it on marshy soil. If not too fat, the pig is a swift runner in spite of its short legs.

We can understand a little of the pig's conversation. There is the nasal growl when fighting and the squeal of terror; the constant grunting meant to keep the herd together, the complaining squeal of hunger, and the satisfied grunt signifying enjoyment of food.

Today there are black pigs with white markings that have ears standing erect; there are black pigs and white pigs with drooping ears; chestnut pigs with drooping ears; white pigs with erect ears; there are pigs fat and pigs lean; there are large pigs and medium pigs and small pigs; but the original pig sagacity may be found in them all in greater or lesser measure.

Nature-study not only educates, but it educates nature-ward; and nature is ever our companion, whether we will or no. Even though we are determined to shut ourselves in an office, nature sends her messengers. The light, the dark, the moon, the cloud, the rain, the wind, the falling leaf, the fly, the bouquet, the bird, the cockroach—they are all ours.

L. H. Bailey.

The Razorback

RAYMOND W. BELL
Brasher Falls, N. Y.

Much may be said concerning any one of the variety of pigs that are known to us, but in this case I will endeavor to tell about the razorback as found in some parts of Florida. People, there, I am told, pay about as much attention to their pork as the Westerner does to his beef. They keep their pigs marked as well as possible and let them run loose among the pines and underbrush in the vicinity to obtain food and live as well as they can.

During the daytime these lean hungry-looking animals rove about, crawl through fences and arouse the owners of fruit groves and sweet potato patches to a burst of anger, seldom heard of when things are happening to suit them. If something good is found to eat, other pigs may be drawn to the spot by the contented grunt of their fellow. Nights are spent in some dark place where there is plenty of material to be found to make a soft bed. I have walked back and forth on the steps of a postoffice in middle Florida, that was situated near the railroad station, while a pig protested against the unusual noise overhead by emitting numerous grunts of annoyance.

The home of this species of the pig family is anywhere within a radius of half a mile or more from the residence of the owner. No doubt each pig spends the night in any favorable place near where it is roaming when darkness arrives.

The name "razorback" is a description in itself of the general shape of the body of these animals. Indeed most of them are so long and lean that one may see the backbone outlined underneath the thick skin. The legs are long and fitted for running. The large two-hoofed toes enable the creature to walk or run easily over dry ground, and the two hind legs, smaller but longer, help to sustain it in marshy soil.

The most noticeable thing about one of these pigs, as a person sees it loping away, are the large flopping ears, placed well up on the head. In appearance the eyes are small, very bright and more intelligent than those of many of our wild or domesticated animals. When we try to think of an animal that has a highly developed sense of smell we think first of the cat. But the pig has just as

good smellers as any cat, for it is said by one trustworthy author to be able to distinguish chaff from grain and to follow a track almost as well as a dog. The nose or snout is a fleshy disk wthi nostrils in it, and it is a most sensitive organ of feeling. This organ is used for rooting up food from the ground and if the farmer wishes to stop the pigs from doing this, he puts rings in their noses. The "razorback" has a very long nose, strong and especially adapted for food getting.

A strange thing about the upper canines is the fact that they curve upwards thus causing the cheeks to protrude. They are used not only in masticating food but as a weapon in time of danger when the enemy gets within biting distance.

The covering of the pig is a thick skin covered with sparsely scattered hair or bristles. Indeed there are so few that they are of little use as a protection against the cold, flies and pests of different sorts, so the pig looks around for some cool shallow pool or marshy place where it can immerse itself and thus become protected from attack. The bristles are, however, a great protection against scratches, as it wanders through the underbrush.

It is very seldom that one sees a black pig among the "razorback" type. Usually they are or would be white in color if it were not for the dirt that has accumulated. There being no other color markings, this rather dirty white renders the pig quite inconspicuous.

When aroused, the razor back shifts from low to high speed very quickly. If not scared, these movements are heralded by a special kind of a horn, characteristic of the pig only, and known as a grunt. Some people grunt but the two grunts are easily distinguishable.

I have never seen the pigs of Florida playing or showing much pleasure, but at home especially when a new bed of shavings or straw is being given them, pleasure is shown among the group by a general frisking about or turning around rapidly and knocking into each other. Indeed it is often worth the trouble to give them extra bedding just to see them perform in this manner. Pleasure is also shown by emitting a satisfied grunt. When out of sight of a group of pigs but within hearing distance, it is easy to tell the pig's mood and the condition in which he is by the tone of voice.

Of all animals, the pig is naturally the neatest, keeping its bed clean in spite of the filthy surroundings. I do not know how the wild hogs protect their young but in defending them, the tusks are used to good advantage. Sometimes it is dangerous to attempt to take a little pig from its mother, for one is in danger of being bitten quite badly.

When the weather is cold pigs form a bed and huddle close together for mutual warmth and protection.

Bad Mr. Squirrel. A Story for Primary Pupils

ADENA K. BURT
Lake George, N. Y.

It was the brightest morning you ever saw and Mr. Squirrel woke up very early; long before you and I ever think of getting up. He scampered out on one of the tip end branches to look around and see if any of his friends were up too; the branch wouldn't have held us even when we were tiny babies. He sat there washing and rubbing his eyes to send Mr. Sandman home.

But he wasn't the only one who wanted to play in the pretty sunshine, right below him scampering along the stonewall was Mrs. Chipmunk with her cheeks all puffed out. She looked like Big Brother when he had the mumps. "Good morning, Mrs. Chipmunk," called Mr. Squirrel, "and what are you doing up so early?" "Oh, I am very busy gathering all kinds of good nuts for my family to eat this winter. You see I keep my food away down under the earth in a big room and when I wake up in the winter, I don't have to come out in the cold and snow like you to get my breakfast, it is right before me, Mr. Squirrel. Besides, I have to be up before the little children come to school or they will fill their pockets with my nuts for their teacher."

"Oh, I store up my food too," said Mr. Squirrel, "but not all in one place under the earth like you. I keep mine in attics way up here in the trees. In the winter when I get hungry I come out and go to my little attics and eat; I don't mind the cold at all."

"Did you see that little boy here last night with that big, big gun," said Mrs. Chipmunk. "Oh, yes I did," said Mr. Squirrel, "and I sat just as still, curled up in a little ball on that

big branch over there. He walked right under me and never saw me. I should think he would have seen you, Mrs. Chipmunk, with all the little black stripes on your back." "But," Mrs. Chipmunk said, "I sat behind that big rock over there and the boy didn't see me either."

Naughty boy! None of my little boys in this room are ever going to frighten Mr. Squirrel and Mrs. Chipmunk so much, I know.

Mrs. Chipmunk ran off with her cheeks full of goodies behind the rocks while Mr. Squirrel rubbing his face watched her disappear.

"My!" thought Mr. Squirrel, "I must get my breakfast. I wonder if Mrs. Chipmunk will make a little pile of those nuts outside of her home before she takes them all inside. Ha! Ha! I'll just go and see," he thought. With a few jumps he was down from the tree and following Mrs. Chipmunk. Sure enough, there was the little pile outside her home, all ready to take inside. Mr. Squirrel hid behind the rock and watched Mrs. Chipmunk take the nuts out of the little baskets in her cheeks, put them down and the run off for some more. Bad Mr. Squirrel ran to the pile and, making several trips, stole enough for his and his brother's breakfast. He doesn't have baskets like Mrs. Chipmunk to carry his food in and so he uses his teeth. Wouldn't his mother have spanked him if she knew? But they tasted as good to him as candy does to us when Mother says, "No! No!"

When Mrs. Chipmunk came back and saw her pile of nuts nearly gone, she chattered and scolded for a long time, but Mr. Squirrel was afraid of what she would say and had run far away.

We didn't see what Mrs. Chipmunk did to bad Mr. Squirrel but I guess he never stole from her pile of nuts again.

Begin

"Persons hesitate, fearing that they will make a mistake. A teacher asked me the other day where he should begin with nature work. He had been considering the matter for two or three years, he said, but did not know how to undertake it. I replied, Begin! Head end, tail end, in the middle—but Begin! There are two essential epochs in any enterprise—to begin, and to get done."

L. H. Bailey.

THE NATURE-STUDY REVIEW

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Editorial

THE NATURALIST IN CAMP

The soldier who is a naturalist certainly has a very important advantage over his less favored comrades. Most of our soldiers, so recently peaceful citizens following their various walks in life, find little in their new environment which interested them before they entered the army; even their recreations to a great degree, belong to a new order and a different world. Not so the Naturalist! During any leisure he may have that gives him even an hour away from barracks, he finds the same interesting world that he has always known and loved, and a place where he is at once at home. Even though he find in field and wood many new acquaintances among the plants and animals, yet each extends to him a friendly greeting and a pressing invitation to stay as long as possible and to come again soon.

Much evidence bearing on this fact has come to the Editor who has had many pupils and student friends who have changed the vasculum for the rifle, the insect-net for the Browning gun, or have been transformed from bird-students into bird-men. Soldiers from the North find much that interests them in the fauna and flora in the environment of Southern camps. One writes of studying the cotton, and another of the birds he had never seen before. One student in horticulture, and well fitted for eminence in that field, writes home with enthusiasm of the flowers he has found blooming in France. These letters prove most perturbing to the Censor, who being entirely ignorant of botany and the Latin language, found in the impressive scientific

names of the plants a spy code, until he was convinced of the legitimacy of this nomenclature. An aviator, wherever he happens to alight, at once begins to hunt for insects belonging to a certain family, upon which he is the highest authority.

There is a free-masonry among nature lovers; they seem to find each other in the cantonments. One of the former assistant teachers in the Cornell Nature-Study classes writes from a southern camp enthusiastically of finding six entomologists and seven naturalists among his fellow machine gunners.

Thus we may know that a love of nature and a comradeship once established with her, always a spiritual asset, is especially so to the soldier. One boy, soon to attain the age for enrollnemt, said last summer, "I am learning the names of the large stars and the chief constellations and their places in the heavens so that when I am in camp I can find friends I knew at home every time I look up into the skies at night."

To the naturalist this earth and the heavens above are as a continued story on open pages, and all he has to do is to stop and read another chapter, wherever he may be. Mother Nature keeps in close touch with her child, wherever he may wander, and especially if he is a soldier.

"And when the way seems long,
Or his courage begins to fail,
She sings a more wonderful song,
Or tells a more wonderful tale."

"If one is to be happy, he must be in sympathy with common things. He must live in harmony with his environment. One cannot be happy yonder nor to-morrow: he is happy here and now, or never. Our stock of knowledge of common things should be great. Few of us can travel. We must know the things at home.

Nature-love tends toward naturalness, and toward simplicity of living. It tends country-ward. One word from the fields is worth two from the city. 'God made the country.' "

L. H. Bailey.

Teachers' Corner

The whole object of a tree is to develop its fruit, therefore much stress should be placed upon the fact when teaching about the nuts which interest children as much as they do squirrels in the autumn.

Each kind of nut is protected differently from any other, and is different in form, and each has its own way of finding a place where it can plant itself and grow successfully. The following are suggestions for studying the more common nuts.

The Chestnut

Where on the branch is the bur borne? How does the green chestnut bur look? Why is this prickly exterior beneficial to the fruit? Does the bur open easily when green? What causes the chestnut bur to open? Into how many lobes does it open? Describe an open bur outside and in.

Where in the bur are the chestnuts set? How many in one bur? How can you tell by the shape of the chestnut whether it grew as a twin or single in a bur? Are there ever three in a bur? If so, what shape is the middle one? Do the burs fall when the chestnuts are ripe?

Take a single chestnut. Describe its shape and color. What is the mark on its large end? Describe the coloring and covering of the tip. Open the shell and note the lining. Describe how the meat is finally protected. Can you see where the germ is? Plant a chestnut and watch it grow.

The Hickory Nut

Describe the outer husk of the nut. Into how many sections does it open? Does it cling to the nut and fall with it to the ground? Is the nut angled and pointed, or is it roundish and without angles? Is the kernel sweet or bitter?

The Acorns

Describe the acorns which grow on your oak. Has the acorn a stem, or is it set directly on the twig. How much of the acorn does the cup cover? Are the scales on the cup fine or coarse? Is the cup rounded inwards at its rim? What is the length of the acorn including the cup? The diameter? Are there acorns on your oak in winter? If so, why? Is the kernel of the acorn sweet or bitter? Plant an acorn and watch it sprout.

Billy the Boy Naturalist. Wm. A. Murrill, Assistant Director of the N. Y. Botanical Garden. Published by the author. Bronxwood Park, New York City. 252 pp. Many illustrations. $1.50.

This little volume of nature stories and observations must be autobiographical, since they are the actual experiences of the boyhood of one living close to nature's vast storehouse of teeming life. Each account is distinct and complete in itself, and deals with many animals and plants portraying in a true and accurate manner the happenings on farms in Virginia and Tenenssee. The incidents are written in a manner attractive to children, and reveal what good times and great stores of knowledge awaits the boy or girl brought upon a farm, and makes one understand how such children become bigger and stronger and get far more of what is worth while out of life.

Since the stories are not connected they are well fitted to be read separately as bed-time stories, and they touch upon many matters which lead to further consideration, and at the end many questions may be asked, as a means for stimulating deeper investigations into nature's ways. The illustrations are many and attractive. Billy the Boy Naturalist is a most desirable addition to the juvenile library.

Our Palace Wonderful. Rev. Frederick A. Houck, D. B. Hanson & Sons, Chicago. 178 pp., illustrated. $1.00. Third Edition.

Few people who devote their lives to the study of the natural sciences, fail to gain, as their knowledge grows, a greater reverence for the Creator of the Universe. This may be all the more true because they rarely speak about it. However, Father Houck believes it is well worth speaking about and in this truly religious little volume he discusses the reasons why the more we study our world the greater must be our appreciation of the wisdom and the love of God. He says the aim of this little treatise is "rather to confirm the believer than to convert the unbeliever."

The first chapters are given to the discussion of the agnostic, the materialistic and the pantheistic theories of the origin of the Universe, and leaves none of them a leg to stand upon. The bulk of the book is used in illustrating how a study of the minerals, the stars and the plants leads to the conclusion that they all postulate a Creator. A chapter is given to "Man, the Sovereign Tenant" of this world palace wonderful. Father Houck shows his own gentle character and beautiful faith in arguing for the thesis, "Man, the Object of God's Loving Providence in this World is Destined for Eternal Happiness in the Next World."—and continues the revelation of himself in the chapter, "The Study of Creation begets Charity." The author of the Palace Beautiful is a religious man who loves his fellow men and feels at one with the whole wonderful universe.

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THE
NATURE-STUDY REVIEW

VOL. 14 NOVEMBER, 1918 No. 8

The Story of the Little Red Schoolhouse

EDITHA S. CAMPBELL
Erie, Pa.

Once upon a time there was a little red school house, built of red brick. And fifty years had passed over its shingled roof. The one room was drab — as near as one could tell,— drab like the school-life of the children who had come and gone through the one brown door for all those years.

Teachers had come and teachers had gone, some bringing light and joy to the old four walls and interest in the 'readin', 'ritin' and 'rithmetic, the children were required to learn.

The community was made up of hard-working plodding farmers, not very prosperous, and like the rest of us, until shown a more profitable way — each was treading in the old, old path.

We all know how little of outside interest comes into the life of the country man, woman and child. Now in the opinion of the writer, the very best of everything, books, lectures, and lecture-slides should be taken to the country. City people have their libraries, art-galleries, good amusements, so many, many things to waken their minds and educate them.

There was one member of the community who having become interested in the school and the need and hunger for good reading, began to work and plan and soon a little circulating library was established. The librarian of a city library and her assistant were most kind in helping out the private books which had formed the library nucleus. The hunger grew, fathers and mothers sent for books, and the number of books was increased from a hundred to almost two hundred. This work was intended for special attention after the school session; but the teachers of that winter were open to new interests, so on the day of the establishment of the open book-case, the last period was given over to reading and a story hour was started. The stories were

selected from the best of all literatures; as the work grew, these became more and more Nature and Science stories. Soon a Baloptican lantern was purchased by the interested one and rental slides from Philadelphia and Harrisburg were procured, and some subject slides purchased outright. Of course the slides

The old red schoolhouse

were placed, lecture given and points of interest on the screen pointed out, all by the one person. But what cared they! We were like a big family and the "one woman" appointment has never been noticed. Mothers tried to come the days of a special story or a slide exhibition. Their interest was intense and their gratitude almost pathetic. Right here let me say, never *read* a lecture. Prepare yourself with material from your own searching, as well as the material which will come with the slides. "It

takes too much time" you say. Of course it does; and it may take you from work you like better, but it will be the best investment of time and money you can make. And if you have a child, take that child along and let it enter into the work, which will prove a big developer.

Corn clubs were being started all over the country, so four years ago one was organized in this little red school house. Three boys entered, but as only one father would give the one-fourth acre required, only one boy had won the ten ears of corn, and of course had all of the premium. Ethically there should be no prize, but ethics sometimes must come second and the dollars and cents must speak first. What happened next spring? The inevitable. *Five* boys made their fathers see there was "money" in seed testing and proper planting and care; and thirteen girls enrolled in a garden club. The premium money was raised to twenty dollars, and a compound microscope purchased, that we might study the soil, root-hairs, water impurities and the almost invisible destroying insects. The two clubs met once a month with the Farm Agent, during the summer and all that was injurious and beneficial to corn and vegetables was discussed.

That summer we had a canning demonstration by one of the State College girls, to which came not only the Garden Club girls bur the women of the community.

In the Fall there was held at the County Court House an exhibit of farm produce and domestic science from the country, entered by girls and boys from eight to eighteen. Our two clubs entered and also boys who did not belong to the corn club. They carried off fourteen prizes amounting to forty dollars and seventy-five cents. One boy received ninety-nine points on potatoes, losing the hundredth as an exhibit point only. Including their own round up of twenty dollars, the community boys and girls had made sixty dollars and seventy-five cents. The father of the boy who won ninety-nine points on potatoes and who could not be persuaded to give up ground required, the following spring, not only gave up one-fourth acre for corn to one boy, but one-eighth acre for potatoes to the second and allowed the third to join the poultry club. The fathers were beginning to see "it paid." That summer twenty-three boys and girls were working in corn, potato, poultry and canning clubs and the premiums grew. This money was still furnished by one

individual because the fathers in giving up the acreage were feeling they were doing their share. The time will come, however, when they themselves will suggest raising the premium money among themselves, but the advance must be made step by step.

Two good farm papers were placed on the reading table and the boys encouraged to take them home, incidentally interesting the fathers. A big point was added in giving out little account books in which the pupils were required to keep an accurate account of all expenses, sales, and time spent in work, using the wage scale set by our State College. These accounts were to count for two points in the round up.

Last winter the Poultry Club worked for the output of eggs, trying to learn that proper care, feeding and housing will influence the laying. This Spring when the Government put out a call for more farmers to keep bees, we added a Bee Club, using for our text-book Mrs. Comstock's own interesting book on "How to Keep Bees," and which one girl who is expecting to teach wanted to know if she "couldn't own."

Community meetings were held evenings, with an attendance from fifty to seventy-five.

Two years ago two of the men of the district bought formaldahyde for oat smut, and this spring seven bought lime for their fields which they had never done before.

This Spring two cases of insects, one hundred specimens each, one of the injurious and one of the beneficial, were hung on the wall of the school room, and also two empty cases into which pupils are to put their own economic collection and make up the life histories as far as possible. Charts of the Insects and their bird control were printed and given to each club member, and now are to be added circular directions for the spray controls and times for spraying.

During August of this year on the spur of the moment it was decided to exhibit at the County Exposition. The women entered their canned fruits and vegetables, illustrating their cold pack demonstrations, and dried fruits and vegetables to illustrate the bulletin put out asking the housewife to conserve by the drying of foodstuffs. I think I can safely say the premiums did not enter their minds; they were animated by the spirit to pass on the good things they had learned. They were even careful not to duplicate, but to have as great a variety as possible. One of the men entered

geese, winning one first and three second premiums and the women with their cannings and vegetables won premiums amounting to fifty-six dollars and twenty-five cents.

Now what became of the little red school house? Why it simply couldn't stay "little". Two years ago it evolved into a school building worthy of any city, with the best working plan for a small school building I have yet to see. A splendid basement, two rooms downstairs, an auditorum and library room upstairs. The best of plain oak desks and chairs for the teachers and adjustable desks and seats for the children. A very busy science teacher from the City High School put his best efforts and time in making it complete.

The community is awake, and if any are "sleepy" they will not be so long. The one Big Hope growing from all this is, that the boys and girls will want to stay on the farm, instead of drifting into the excitements of the city. Stay where their big work can be done and learn that to co-operate with the great creating forces of nature is a work almost sublime.

The new schoolhouse

The Consolidation of Rural Schools

W. Clement Moore
New Egypt, N. J.

In the administration of rural schools lies a problem worthy of the best skill, the best thought and the most careful attention that can be given to its solution. In America, our greatest opportunity to accomplish real results, lies not so much within the well-built and artistically decorated walls of the million dollar high school of the city, as it does within the less pretentious and often sadly neglected appearing rural school.

But it happens that at least fifty per cent. of the superintendents supervising principals and supervisors of the country in general, have control over one or more rural schools in addition to the supervision of the town and small city schools — county superintendents especially have this double problem of advocating plans, methods and suggestions for the government and betternemt of both rural and city schools. It follows naturally that board members of the same localities will be called upon for decisions relating to both problems. A discussion, therefore, of the status of the rural school in America, might prove both interesting and of practical benefit to all concerned.

There are just two ways of solving the problem:

One method is to dispense with the small rural school and transport all of the children to a central consolidated school where better instruction may be given and the children may have the advantage of better light, better heat and better general equipment, besides more expert supervision.

The other plan is to conserve the natural resources of the district in which the school happens to be located, and bring to it, the best teaching ability, the best equipment, good books for library use, decorations, ample playground material, a course of study adapted to the needs of the locality and a neat, warm modern school-building even if it happens to be only a one room affair. Some superintendents have already solved the problem by using both methods — O. J. Kern for instance, in his work in Winnebago County, Illinois, has not only brought about the building of consolidated schools but has remodeled the old rural schools and rebuilt them so that in many cases the conditions surrounding

the rural schools in his county are to be preferred to many which exist around much more costly city schools.

If the rural school is isolated, and transportation to a union-graded school should prove too expensive, then the improvement of the rural school as it is, is the problem for solution, but wherever two or more one or two-room schools may be closed and a new consolidated school built with convenient reach of both districts, then public sentiment should be at once directed along that line.

Objections will arise, of course, but they can be overcome through the exercise of wisdom, diplomacy and good judgment. You must as a superintendent or board member advocating such a change, know the facts in favor of consolidation, the benefits to be obtained and something of actual saving financially if such can be brought about. You must also use diplomacy in your method of attacking different persons and principles, and when you have won any point, judgment must be used in its execution.

It is a fact that the little rural schools must have each their own equipment, their own buildings, heating plants, etc. The cost of supplying all of these separately and in groups is much greater than the combined cost would be if applied to one building. Again these schools generally, are intended to provide the first eight grades of elementary instruction. In the one-room the eight grades are being taught by one teacher — there is an average from one to four or five pupils in each grade — each grade must have its supply of text-books, pencils, supplies, etc. There is eight times the demand made on the teacher's time in the one-room school, that there is in the consolidated graded school providing a grade to each teacher — and consequently each pupil in the rural school received one-eighth of the time that could be given him by the teacher in the consolidated school. All of the above are prominent points in favor of consolidation.

No doubt you have all read what Assistant Secretary of Agriculture W. M. Hays has to say about the rural school in one of his bulletins, but I am going to present just a portion of it as follows:

"While in the city the improvements have been in the direction of fine, highly equipped buildings, libraries, and apparatus for instruction in science and in some cases in the mechanic arts and home economics, the efforts of the rural districts have been directed toward *increasing the number of school houses at the*

expense of the size of the district and the quality of the school buildings and equipment, until the contrast between the city and rural education has been painful. The time for an inward struggle to throw aside the old, though it be one of our dearest institutions, has come, and one community after another will now respond to to the spirit of the times."

"All who have a clear knowledge of the facts regarding rural school consolidation realize that a large percentage of our rural schools are to be consolidated into larger units, at once providing better conditions for instruction in the general studies and making it possible to add much that relates to the vocations of farming and home-making. In the UNITED STATES THERE HAVE BEEN OVER SIX HUNDRED SUCCESSFUL EXPERIMENTS AT COMPLETE CONSOLIDATION OF RURAL SCHOOLS, AND PRACTICALLY NO FAILURES."

No superintendent should lose sight of the fact that his newly consolidated school is not to be a city school in any sense of the word, but simply a larger unit in rural education, the children nor their needs, neither of them, have been changed in the least by the transformation from the lowly roadside school to the fine new brick building — nor should the course of study be changed to any great degree. Give them things which will teach them to love, revere and manage the farm better. Give them work that will employ the hands as well as the mind for a part of the day, and the aim of the rural consolidated school will not be lost.

In America today, we have 300,000 little rural schools, and at least 200,000 of them might be united into 30,000 consolidated rural schools, to the complete advantage of the whole country. Such is the importance of the problem of consolidation.

The advantages of the method are obvious. The fusion of a number of small districts into a larger administrative unit furnishes a stable and extensive basis for financing the school and thereby makes for higher efficiency. The larger number of children assembled at a centrally located school makes possible graded classes and a better division of the school day. Studies can be introduced which require special equipment and teachers specially trained in agriculture, home economics, manual training, music, drawing, etc., all of which are, as a rule, unattainable in rural schools.

In closing, a few practical hints in regards to methods of working up an interest for consolidation in YOUR locality, may be acceptable.

First, enlist the staunch support of the local newspaper or newspapers of your town or county. Clip or write for them each week for several months before you even mention consolidation for your district, all of the material you can get favoring consolidation. Tell the editors your plans, but no others. When the time comes for you to make a public announcement, then have the editors give you all the space possible and solicit for publications and favorable opinions of prominent men of your locality.

Next get from the department of agriculture and department of education at Washington, and from your home state, all of the free printed matter that you can get, and distribute that among those who are interested or opposed either.

Another good preliminary plan is to secure the aid of a dozen or more influential men and women and have them speak well of it to others wherever and whenever you can.

Gather data from the little schools which will give you accurate, convincing facts regarding the following points in each school: school, salaries, fuel, heating, janitor, repairs, books, supplies, and to the above add any other special items of expense. Then find the total annual expense of conducting each school, and the total for all of the schools, then make an estimate of the cost of transporting the pupils to the proposed new school and the expense of conducting that school on the improved plan. It will not be a difficult matter for a convincing speaker to make plain the saving in cost and time, and the gain to the community and its children. The day of voting should be preceded by a day or evening of special lectures in favor of the proposition. The result should be a favorable one.

"I find sweet peace in the depth of autumn woods,
Where grow the ragged ferns and roughened moss:
The naked, silent trees have taught me this,—
The loss of beauty is not always loss."

—*Elizabeth Stoddard.*

The Nature-Study Situation in Kansas for 1917-18

FLORENCE G. BILLIG
Supervisor of Elementary Science, State Normal School Emporia, Kansas

To secure some definite information concerning the nature-study situation in the state of Kansas, a questionaire was sent to each superintendent of schools in cities with a population of fifteen hundred or more and to the persons in charge of the nature-study work in the three state normal schools.

From the one hundred letters sent out, seventy-one replies were received. The replies were from towns ranging in size as follows:

Thirteen replies from towns with a population of over 10,000.

Twelve replies from towns with a population ranging from 4,000 to 10,000.

Twelve replies from towns with a population ranging from 2,500 to 4,000.

Thirty-one replies from towns with a population ranging from 1,500 to 2,500.

Three replies from state normal schools.

It is obvious, then, that approximately sixty per cent of the data from this investigation was furnished by superintendents of schools with a population ranging from fifteen hundred to four thousand.

Chart I gives the data received from the seventy-one replies. Chart II shows the same information in graphic form. 83.09 per cent of the schools reporting, teach nature-study while 16.91 per cent do not teach it. 28.81 per cent of those schools teaching nature-study use an organized course of study. 67.79 per cent of the schools teaching nature-study have no organized course or leave the work to the individuality of the teacher. Two schools are organizing courses of study.

Charts III and IV show the extent to which nature-study is correlated with the other studies taught. 25.42 per cent of the schools teaching nature-study do not teach it as a separate subject with a definite place on the program but teach it in connection with other school work. Sixty-four schools report physiology taught as a separate study.

By a study of charts V and VI, it is noted that about 81.35 per cent of the schools reporting the teaching of nature-study teach-

it in the first four grades, that 62.71 per cent teach it in grades one through six, while 44.06 per cent teach it in all of the eight grades.

The amount of time per week given to nature-study varies from no regular period to five hours. An average of sixty-eight minutes per week is given to the work by those schools reporting the time given to nature-study.

The preceding information is correct, in so far as the data received from the replies to my questionaire are correct. It is, however, not conclusive, but it is interesting for the reason that it gives definite information concerning the nature-study situation in Kansas during the school year 1917–1918.

While interesting, the value of the above information would be increased by a discussion of the work that is being carried on by the various schools in the state.

The Elementary Training and Junior High Schools of the Training Department of the Kansas State Normal School are doing some definite work along this line. We are not certain that we are attacking the problem in the best manner, though some excellent results make us feel that we are at least headed in the right direction.

The aim of our schools is to prepare boys and girls to live well and to occupy intelligently their places in society in general. One need only to study the world's advancement to learn that progress is everywhere concerned with a knowledge and utilization of nature. In consideration of these points, nature-study and elementary science cannot be omitted but must necessarily hold an important place in the school curriculum.

In the training department of the Kansas State Normal School, a flexible, tentatively organized course of study is used. This course does little more than show the large projects on which the various grades will work. Many of the most valuable problems arise unexpectedly and cannot be included in an outline of study for similar situations may not arise the second time.

The work in the kindergarten and primary grades is largely based on nature. The children come to school alive with nature experiences for they have been living an out-of-door life. Nature experiences, then, serve as one of the connecting links between the home and school.

In the intermediate grades and the junior high school, the nature work and geography are so closely related that they go hand in hand. In grades four, five and six, the six hours a week given to the two subjects are divided equally between the geography and the nature-study classes. In the seventh grade, geography study predominates, receiving five hours a week. During this year, the nature-study work is continued in its close relation to geography but the emphasis is particularly on geography the definite study of which closes in this grade. In the eighth grades, predominance is given to elementary science which is followed by general science in the ninth grade.

The physiology and hygiene work is considered a part of the nature-study and elementary science course. The personal hygiene phase is studied in close relation with the physical training department which has the equipment and the desired atmosphere for accomplishing the best results. The experimental phases of hygiene are emphasized in the science class. In the "Health and Clean Up" committee, the children make and establish means for enforcing rules regarding personal and room cleanliness.

To carry out projects which are undertaken, correlation in a broad sense of the term is essential. To solve the problems involved, help from all departments is necessary. For example, in the garden project, many subjects are concerned. The catalogues from the various seed houses and the seeds from the government are secured as a result of letters written in the English classes. In the manual training classes, the germinating boxes and stakes for the garden are made and the hoes and rakes are kept in repair. In the arithmetic classes, the pupils are taught the best way to keep accurate accounts from which they are able to give definite results as to gain or loss resulting from their undertaking. In the domestic science classes, the best methods of preparation of vegetables for the table and preserving or storing for the winter, are studied. The pupils discuss the value of the garden products. They learn to recognize quickly the qualities desired when buying vegetables. Many of the vegetables grown in the school gardens are sold to the classes in cooking. The location, soil, moisture and drainage of the gardens concerns the geography class.

The garden work closely unites the school and the community. The school garden serves only as a laboratory where boys and

girls learn the principles of gardening which are applied in their home gardens. The community market reserves a section for the use of children where products from the school and home gardens may be sold.

This correlation is brought about by the child, who, when working on his project feels the need of help from the various sources. It is he who after careful study states his problems and seeks assistance from the different departments which gladly co-operate with him.

This correlation is prominent in all projects undertaken. The extent to which it is felt in the school and carried out in the community at large varies with the nature of the project undertaken.

It is evident, then, that our elementary school curriculum cannot longer consist of many separate subjects each of which is developed from the point of view of a specialist for the advancement of his own subject but must be a unit with a strong central purpose. Each study serving as a necessary part of the successful carrying out of the aim; each study remaining in the curriculum because it is an instrument or tool with which the school cannot dispense if the boys and girls are to become socially and economically efficient men and women in the community in which they are living.

NUMBER OF SCHOOLS REPORTING	
To Questionaire	71
Teaching Nature-Study	59
Not teaching Nature-Study	12
Organized course	17
Unorganized course	40
Organizing course	2
Correlating Nature-Study with some study	15
Teaching Nature-Study in grades 1–8	26
Teaching Nature-Study (only) in grades 1–6	11
Teaching Nature-Study (only) in grades 1–4	11
Teaching Nature-Study throughout the year	29
Teaching Nature-Study spring and fall	1
Supervisor of Nature-Study	5

Chart I. The Nature-Study situation in Kansas; based on data received from 71 schools

NUMBER OF SCHOOLS CORRELATING NATURE-STUDY WITH	
Other studies	15
Language	4
Language and drawing	1
Language, drawing and geography	1
Language and geography	3
Geography	1
Geography and drawing	1
Drawing	2
Study not given	2

Chart III. The extent to which Nature-Study is correlated with other studies

NUMBER OF SCHOOLS REPORTING TEACHING NATURE-STUDY	
In grades	59
Only in grades 1–4	11
Only in grades 1–6	11
In grades 1–8	26
In grades 1–4	48
In grades 1–6	37
But not indicating grade	11

Chart V. Grades in which Nature-Study is taught

Riley's Gift of Bird Song

ANNIE SMITH NINMAN
Peoria, Ill.

"The flash of the red bird's wings"

October seventh, the anniversary of the birth of the children's poet, James Whitcomb Riley, is a day of interest in the school curricula, for on that day children in all the schools, pause in restive mood, to enjoy the poet's songs of nature's recurring pleasures; the gift of flower and sunset cloud; of bird and blue expanse of water.

The poems of Riley awaken within the hearts of children a greater love for nature, for life, for birds and all growing things. To Riley, nature was the very epitome of all that is harmonious in life. His verses of bird song, of sunshine-sky, of rippling waters attune all attributes of nature that make for enjoyment, such attributes as truth, love, faith, appreciation and inspiration.

"With head uncovered has he stood,
Hearing the spirit of the wood
Hearing aright the Master speak
In trill of bird. . . ."

On days that are dreary, we may listen to the worded songs of the feathered friends that Riley has listened to and believed in. . . "the songs that nature sings — in every bird that twitters."

"There's the song of the lark, when the skies are clear,
And the song of the thrush, when the skies are gray."

"And in and out when the eaves drip rain,
The swallows are twittering ceaselessly."

If there is to be found bird song in the rain, then there is laughter and chatter and melody when the golden sunshine is every where, in woods, in fields and pastures green. Riley has said that —

"The robin pipes when the sun is here"

and it is Riley who bids you to sing with "every bird on every bough,"

"Sing! every living loving thing—
Sing any song, and any how
But Sing, Sing, Sing!"

In the poem the "Song O' Cheer", Riley tells of the hearing of cooing mournful notes of birds — that are not to be echoed by the heart.

". . . Whipperwills and doves says I
H'aint over cheery critters,"

There is laughter in the sunshine and the gay whistling of the birds and for the cheer giving critters, he gives Old Bob White and the Pee-Wees and the chattering of the blackbirds.

"Old Bob White
Whistles his name in high delight
And whirrs away".

"Pee-wees' singing, to express
My opinion's second class
Yet you'll hear 'em more er less;
Sapsucks gittin' down to biz,
Weedin' out the lonesomeness.

"Mr. Bluejay, full o' sass
In them base ball clothes o' his"

Oh, the naughtiness of the birds as they scold and boss and beg in Riley's verse of bird song.

"The flicker on the fence-rail 'pears to jest spit on his wings
And roll up his feathers, by the sassy way he sings:"

"You can hear the blackbirds jawin' as they foller up the plow."

"Ketch a shadder down below,
And lookin' up to find the crow —
Er a hawk, away up there
'Pearantly froze in the air."

The haunts of the birds are every where and the eye can take delight in Riley's flight of birds, in the moving bits of color, of which he gives word pictures.

"Watch the swallers skootin' past
Bout as purt as you could ast
Er the Bob-white raise and whiz
Where some other's whistle is."

"Where the 'red-heads' hopped awry
And the buzzard 'raised' in the 'clearing' sky."
"And through the lush glooms of the thicket
The flash of the red bird's wings."

"And the humming bird, that hung
Like a jewel among
The tilted honey suckle horns."

Listen to Riley in his songs of nature, catch the spirit of the woods

"When the meader-lark is wingin'
Round you, and the woods is ringin'
With the beautifullest singin'

and find with Riley the thicket where the red bird is, or thorn and thistle over which quail, with whirs and whistle, whizz; look for the redbreast and the blue bird on the blooming bough and while the robin sings let the heart — "sing like a medder-lark — All day long" on October 7, Riley's Day among children.

A Country Schoolhouse

'Twuz so las' Sabbath arter meetin' time,
Findin' my feelins' wouldn't noways rhyme
With nobody's, but off the handle flew
An' took things from an east-wind pint of view.
I started off to lose me in the hills
Where the pines be, up back o' Siah's mills.
Pines, if you're blue, are the best friends I know,
They mope and sigh an' sheer your feelin's so,—
They hush the ground beneath so, tu, I swan,
You half forgit you've got a body on.
There's a small schoolhouse there where four roads meet,
The door-steps hollered out by little feet,
An' side-posts carved with names whose owners grew
To great men, some on 'em, an' deacons tu;
'Taint used no longer, coz the town has got
A high school, where they teach the Lord knows wot:
Three story larnin' is poplar now; I guess
We thriv' as wal on jes' two stories less,
For it strikes me ther's sech a thing as sinnin'
By overloadin' children's underpinnin';
Wal, here it wuz I larned my A B C,
An' it's a kind o' favorite spot with me."

JAMES RUSSELL LOWELL in *The Bigelow Papers.*

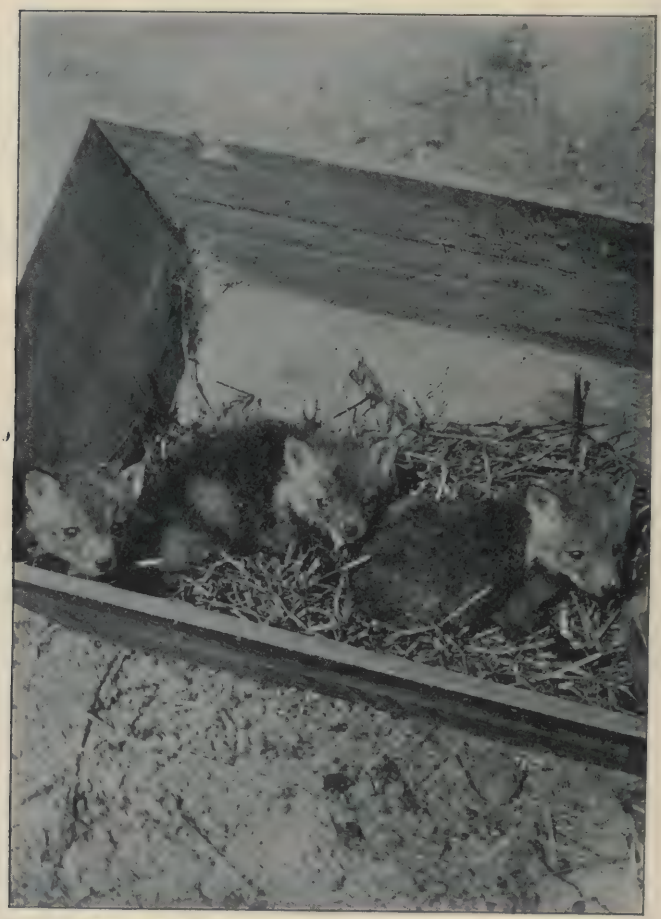

Photo by Verne Morton

Young Foxes

A Story Told by a Fox

MARTHA E. QUICK

Ithaca, N. Y.

(This story was written to make more vivid to the children of a Rural School the habits of a fox which they had been able to observe.)

Here on the top of Bald Mountain is my home whence I have escaped from my many menacing foes. Wild under-brush is all about me, while high above my head towers the rocks and crags. What an ideal place in which to spend the rest of my days. Before I lie down in some snug corner beneath the rocks, I will go to the top of yonder jutting rock and look once more over the wide expanse of country that stretches below.

How well I know and love all the thickets, the gently sloping fields with warm sandy knolls, the deep wooded slopes beyond, the narrow brook winding slowly along. I know, too, the ones who live in those large scattered shapes nestled among some trees where the smoke curls slowly upward. Yonder the cows and sheep are comfortably grazing in the pasture while many of my brothers, both friends and foes, which I cannot see are learning their lessons of the wild.

The first place which I remember was a warm cozy nest where I lay and slept most of the time. My four soft brothers and sisters lay cuddled close around me while near us lay the great furry mother who gave us plenty of warm milk. As I began to use my eyes and look about, I saw that this dark hollow was not all of the world. I saw the great light space from which my mother appeared and disappeared often being gone for hours at a time. I began to scramble about but my slim little legs would not carry me far. At last one day we followed our mother through the great space. How surprised I was to see the great world which now spread below me. At first I shrank back afraid, but after a little coaxing I slunk around the juniper bush near the mouth of the den out into the broad sunlight. I saw there the warm sandy knoll with one or two low bushes near at hand. Far below I saw the tall trees and the brook far beyond.

Our mother stretched herself comfortably a little way below and smiled good-naturedly at her five yellow fuzzy children. I suddenly felt very happy and playful and sprang toward her trying to tell her how happy I was. All my brothers and sisters

began to play and scramble about her. How we liked to pounce and tumble upon her great furry back. but she often gave us a cuff with her strong paw which sent us rolling over and over. Then we would rush at each other chewing and snarling until we tired ourselves out. When the sun began to send long shadows from the tall trees we scampered back into our den. We longed to come out and every morning as soon as the sun was warm we followed our sleepy mother out upon the warm knoll. What delicious feasts Father Fox brought us after his long nightly hunts. We played with the young field mice he brought hanging like a fringe from his mouth. One day we had the best dinner of chicken after which Father Fox told us of the queer human beings who lived far down in the valley, how they hated the wild creatures and were always ready to kill them if they could. He told us of the many good things which we might get to eat but how careful we must be or a dinner might cost our life. After the story I felt like a very wise fox and made up my mind that no human being should kill me although I would like to see them.

One morning I heard a strange noise down in the valley. My mother rose at once in alarm. Quickly she called her children and with a strange feeling of fear we crept far back into the den. We waited long but father never came to bring us the good dinner he had promised. That night our mother did not lie down with us but above our heads under the edge of rock where our father slept we heard the loud sad wail of despair.

The next day mother was gone for a long time. We grew very hungry and unhappy. At last she came bringing a fringe of field mice. I began to wonder when I could go out into the world and find food for myself. Toward dusk I went with my mother for my first lesson in hunting the small wild creatures of the woods. How soon I learned the faint squeak of the field mouse or traced his path by the wavy line of tall grasses. How proud I felt as I pounced with my strong jaws upon the helpless creature.

After a few lessons I went out alone, for then I knew no fear. Once I surprised a rabbit dozing on the sunny side of a clump of briars. I sprang after him as he disappeared among the briars and here learned my first hard lesson. The briars were sharp and blinding and kept me from springing ahead. The clever rabbit escaped easily while my poor head and eyes were burning from the prickles of the briars. I soon found that the other wild

creatures knew the foxes ways and they had ways of their own which I must learn.

While mother was away on her long hunting trips we kept well out of sight, but on sunny afternoons when she lay basking in the sun near the opening of the den, we felt more safe and roamed about along the top of the bank or along the edge of the thicket. One afternoon when the sky was clear a strange shadow swept over the bank. Just then I heard a sharp note of warning from below. I plunged quickly into the juniper bush. The shadow seemed to fall about me and the next instant I saw the limp helpless form of my brother carried away by this great winged creature. For a long time after that I never failed to keep a sharp watch upon the great blue curtain which stretched over my head.

I soon learned that there were enemies on every side and I understood my life must be one of struggle. So the spring months passed and I grew larger and stronger. I became acquainted with the country about me and often stole away through the woods to the spot where I might see the farmhouses below. I liked to watch these strange beings of whom my mother told me many wonderful tales. I knew that my mother did not bring the savory chicken or turkey from these farm houses near at hand but always went over the opposite hill into the next valley where they would never suspect her whereabouts.

As I grew more and more skillful I planned my nightly hunts for myself. I was thinking as I trotted along on a certain moonlight night of what a fine hunter I had become. "Lets see, last night I hunted in the pine woods, tonight, I'll cross the brook and go down the edge of the pasture to the corner of the corn field. There will surely be some silly rabbits playing about in the moonlight, then I will go down to the big West meadow after mice. There are always plenty there. If I dont' get any mice I will spy around that chicken coop at Deacon Smiths. Perhaps I'll see if any of Old Henry's young turkeys are roosting in the orchard. I saw them wandering about there yesterday. How good one of those would taste, or a fine young chicken. I believe I will not go down to the meadows for mice but straight to the farmhouse. I have never tried to catch a turkey or chicken but how proud my mother will be when I bring her one in such a short time." I know the men will all be asleep and nothing will

trouble me. I crept up back of the old barn through the orchard but did not find the turkeys. I went into the barnyard and then I heard a few faint cackles near by in another building. I thought I would go in through a nice little hole which I found. So in I went, but "O silly fox" down came the door! I tried in every way to get out, I did not care about the chickens, but they became frightened and made a great deal of noise. What could I do? Just then the dog began to bark near by and I knew that I was caught. Shortly after, the farmer came and opened the door. He was so surprised to see me that I might have escaped if I had moved quickly. But I had lost all power to run and felt very weak and powerless. The farmer grabbed me by the neck and though I scrambled and bit at him furiously he carried me out and put a cold hard band about my neck and left me in a dark ill-smelling place. How I chewed and pulled at the chain but soon found it of no use. I knew that I was in the power of those dreadful beings. I could not sleep but feeling very unhappy I curled down with my tail around me and thought how terrible my life had become. If I had only followed my mother's advice!

The next morning I heard shouts and the cry "A fox, a fox," outside and three children opened the door and came into the stable. How they jumped and screamed with delight! The boy came toward me but I showed my white teeth at him and he did not dare to touch me. I quaked with fear but soon saw that they did not wish to hurt me. One of them brought me some strange looking white stuff and threw it down close beside me. I would not even smell of it but tried to hide myself among the straw which they had thrown in.

They went away but soon returned to take me. They pulled and pulled on the chain trying to make me follow them but I held back, digging my little claws into the floor. My head seemed almost bursting but I would not move one inch. Then some one took me by the back of the neck and carried me out into the sunlight. I did not try to fight now. I was so frightened, I thought I would surely be killed. They put me in a little house with plenty of stuff for a bed and with the strong band still about my neck, I slunk into the darkest corner and there stayed all the day. I wondered if my mother at home would miss me. If she did she would not come to this farmhouse for I heard the dog barking not far away. How lonely and miserable I felt! but still I was

glad to be alive and planned that some time I would escape from this cruel band and fly back to the forest. That night when all was still I crept out into the moonlight and looked about me, I saw the farmhouse just below surrounded by trees and on the opposite side the house in which I had been caught. I could not help the sad, short, loud, sudden wail which seemed to tell how mournful I felt.— I barked many times and tugged harder than ever at the chain but not an answering cry or sound did I hear. I was alone with these strange human beings and I must learn to live with them.

The next morning the children brought me a pan of water and some food. They pushed it far into the little house and after they had gone I stole up to smell of it. But the water was so clear and my poor throat was so dry that I must have a drink. I could not eat the food. But that night I grew so hungry that I did taste it and found it very good and it made me feel so much happier that I decided to eat hereafter. Every day the children came to see me many times. They brought me much to eat but I would not eat while anyone was near. By this time I began to peep out of doors and watch the strange things which happened about me. I saw many chickens walking about not even noticing me but later coming close to me. I watched them and thought of a plan to catch one. I left some of my breakfast scattered about the door of the house and very soon an old hen came to help herself. How surprised she was when I sprang at her just grabbing a mouthful of feathers. The chickens never seemed to learn better and I often fooled them like this; but found myself jerked back by the strong chain.

I began to rather like the children who brought me food. I ceased to bite and snarl so when they touched me. They did not harm me and after many weeks I knew them as well as some of my first friends. When I felt good-natured I would sleep on the top of a box in the sun and there the children often petted me and rubbed my head. But if I happened to be thinking of my far away home in the forest I would not let them touch me but would hide in the corner of the house. The children often unchained me and now I followed where they wanted me to go for my legs were so stiff and tired I was only too glad to use them. Sometimes they chained me to one of the apple trees and what a good time I had circling round and round or jumping up into the

low branches! All this time I kept growing until now I looked like a grown up fox. I began to be very proud of my fine bushy tail and my eyes seemed to grow brighter every day. One day toward fall I heard the children talking about me. "Let's allow him to go," they said. We do not want to keep him always. We must go to school now." My heart bounded with joy and what a good fox I was. One day when the children were gone the farmer put me into a sack and put me into his wagon. I was carried far. I did not know where I was going or what would become of me. At last he opened the sack and I skipped out. I saw a wooded bank not far away and wondered if I could ever reach it. Yes, my legs would carry me and how happy I was. I bounded away and soon entered the friendly patch of underbrush. I looked back and wondered which life would be the best. After looking about for awhile I saw that I was not far from my old home on the sandy bank. Would my mother still be waiting for me? But alas when I reached the den I found it in ruins.

As soon as my legs grew stronger, I roamed about searching for a new home. I must not stay on this side of the valley for many hunters must have heard of my freedom. I would live and learn to overpower every foe which foxes may have. I knew so many things which other foxes did not, that I was able to defend myself and live happily. Before winter came I found a snug warm place for a den on the south side of this hill. At first the snow was terrifying but soon I found it an aid in finding the whereabouts of my enemies. Many a time I obtained my food only through a hard struggle as in the chase for a rabbit or a partridge. When the great ice froze the swamp and brook and creasted the white fields I had a hard time hunting, but some foolish wood mouse, or often a dead crow, if nothing else, was to be had. If I felt the pinch of famine I did not mind, for I was free. So the seasons passed and many an adventure came into my life. Twice I was followed by the dogs, but how I enjoyed the chase! I would stretch myself and soon leave them far behind. I knew many tricks and ways by which I fooled my followers. I often laughed from some sunny rock while dogs and men puzzled gravely over my trail. I could tell you many stories of tricks which only a fox can know but I do not wish to tire you. So I have grown to be a wise old fox and now must lie down to rest.

Photo by Dr. R. W. Shufeldt

The Study of Moths and Butterflies as a Recreation

CHRISTINE T. ACKER
Camden, N. J.

One day in early fall as I was walking with my daughter, who is seven years old, out State Street to the outskirts of Camden, N. J., we came to the bridge over Cooper River. When that bridge is crossed we are in the country — a long stretch of meadow bounded on one side by the Delaware River and on the other by a farm, Coxie's Pond and fields of many kinds of wild flowers. On a willow tree we found a very large cocoon. Like Pasteur when he called on Fabre to get some silk-worm cocoons, we did not know what we had, nor that there was a live pupa inside. We brought it home and placed it over a picture in the living room. We enjoyed looking at it and wondered what it could be, never taking the trouble to find out. The first week in April as I was passing through the room in which the cocoon had wintered, I saw what I thought the most beautiful creature in existence. I shall never forget the thrill of joy in beholding my first Cecropia. It fired me with wonder and awe to think that such things could exist so close to us and we so uninformed. It inspired me with a desire for knowledge of things out-of-doors, and I shall now try to tell of things I have seen and found within a few minutes' walk of my home.

In many walks I am accompanied by my daughter Eleanor and her friend, Anna, of the same age. All of us have home-made nets. Eleanor's is quite wonderful in size. She says the little butterflies escape when she uses a smaller net. It measures eighteen inches across, and is about two feet in depth. Anna's is smaller, only measuring twelve inches across and one-and-a-half feet in depth, mine being regulation size and pattern and is ten inches wide and eighteen inches deep. We take a pint fruit jar converted into a cyanide jar, a bottle of chloroform and a cigar box in which to carry our specimens after they are dead.

Eleanor captures a kitten in her butterfly net

The first summer in my eagerness and ignorance I gathered everything that could fly, that is, those things that were not too quick for me. In a field of Joe Pye weeds (Eupatorium purpureum), Monarch butterflies (Anosia plexippus) abound. We gathered them by dozens and discovered later that many of them were Viceroys (Basilarchia disippus), the imitators of the Monarchs. This is said to be one of the most pronounced cases of mimicry in our fauna. The Monarchs are bitter to the taste of birds, consequently they are not bothered by them. The male has a peculiar odor coming from a little scent-bag on the under wing, the purpose of which is said to attract the female. The Viceroys are very fragile and dainty and have followed the Monarchs for so long that they have become very much like them in

appearance and habits. The Monarchs migrate in enormous numbers in the late fall. Great swarms of them have been seen flying south. When I was a child, I remember one October in Cape May, picking up butterflies by handfuls. They were Monarchs migrating and were overtaken by a storm which blew them into the ocean. When their wings were wet they could not fly. In places the strand was red with them. I picked up all I could carry and took them to the house where I was staying. Thinking they were dead I placed them in a shoe box without a cover and went out to play. When I came back the people in the house were nearly frantic with the annoyance of butterflies lighting on their heads and hands and flying all around them. The room was a beautiful sight. I pleaded to have them remain but out they had to go. I counted sixty-two that flew out of one window — how many went out of the other openings I do not know.

Just across the road from the Joe Pye patch is a farm where many strange things grow. We gave it the name of "The Drug Farm" because of the many strange things that are raised there and so many things that smell like a drug store. There were plenty of cabbages and cabbage butterflies, (Pieris protodice and Pieris rapae), Common Sulphurs (Colias philodice), which is sometimes called "The Puddle-butterfly". Among them the females were frequently albinos. There were a few aberrations in both families, particularly among the sulphurs. In the "Common Whites", as the cabbage butterflies are sometimes called, a very delicate shade of yellow could be found, sometimes on the forewings, again in the hindwings, and sometimes a little on both wings. These little insects were so numerous that the children amused themselves by seeing how many they could get in their nets before emptying them. They frequently had fifteen or eighteen at one time.

There was something new every day. In the tomato patch there were queer little tomatoes shaped like an egg, though not so large and of a paler shade of red than our tomatoes and very numerous. On these vines we found a larva, or caterpillar, of the Tomato moth (Protoparce sexta). Each day we went to look at the "worm" until it disappeared. In our ignorance again we accused the farmer of killing it. A few days after a happy thought came to us to dig and see if the larva had buried to go

into the pupal state. It had. We found a queer pupa case resembling a pitcher. The tongue case was separated, thus giving it the appearance of the handle of a pitcher. It is a Hawk Moth, so named because of its swift flight. Unlike other cocoon makers it has a well developed tongue and has frequently been seen at dusk hovering around the flowers like a humming bird sipping honey. Were it not for the little Braconids, parasites of this moth larva, there would be so many insects that our own food supply would be endangered.

The pupa of the common tomato sphinx caterpillar

Why is it that when we go without our nets we always see something unusually desirable? One day while at Red Hill Park, Camden, we saw an aberration of a Vanessa antiopa, one with the yellow band extending almost to the body. Dr. Holland tells us there are but three known specimens among collectors. I

The moth of the sphinx caterpillar which feeds on tomato

nearly fell into Cooper River trying to catch it in my hat, but even though I failed to make a capture, I felt lucky to have only one wet foot for we were a long way from home. The Vanessa, or Mourning Cloak, is a very common butterfly in its ordinary form as it is found all over the temperate zone. It is a medium sized insect with an expanse of two-and-a-quarter to three-and-a-quarter inches. The wings on the upper side are generally some shade of black or brown, marked with a deep red, yellow or orange

band on the outer margin of the wings. It is very timid. If one approaches, it makes believe it is dead, probably paralyzed with fear, and can be picked up in the fingers and thrown around. I have wondered if this is a means of protection for it is most unusual. They are the first butterflies to wake up in the spring, coming forth from their sleeping quarters on the sunny side of a fence, or an old tree, or some warm nook, early in March. I have heard reports of them being seen in February but have never had the pleasure of seeing them before March. They make charming little pets in the house during the winter and are easily kept. They thrive on a diet of sugar and water, or a piece of apple dipped in water sweetened with sugar or honey. It is a great imitator, hence its great numbers. When at rest it folds its wings, which are mottled, over its back and becomes quite inconspicuous as it imitates its surroundings. The male is said to be a musician, emitting musical sounds when he goes courting. I have never heard it but I like to think it is so — it makes a pretty fairy-like story.

Another butterfly that always gives me much pleasure is Hunter's butterfly (Pyrameis huntera). The under part of its wings is beautifully marbled in brown and gray, the fore wings have an exquisite spot of lemon or old rose which is completely concealed when the insect is at rest. In fact it is difficult to distinguish it from the silvery grey bark of the trees upon which it rests. Naturalists call this protective coloring. It has a wing expanse of about two inches. There is a very close relative, the Painted Lady (Pyrameis cardui). The two butterflies are marked much alike but are readily distinguished by the large round spots on the under wings of the P. huntera. The larva of the Painted lady feeds on thistles, marshmallow, everlasting and hollyhock, while the P. cardui feeds on the everlasting.

Among the prettiest of the medium-sized butterflies is the Buckeye (Junonia coenia). It is quite unique in its markings. The large spots on the wings suggest peacock-eyes. They are a swift low-flying insect, darting about quickly and are ever ready for a quarrel. Their ill-nature is directed toward other species. They dash at passing butterflies and fight them away.

The butterfly that I have found most difficult to capture is the Tiger Swallowtail (Papilio turnus). The tops of the highest trees are their favorite spots. I chased one at Collingswood, at intervals

for several days before I finally found it on a low bush at rest. I threw stones up in the air because I had read that would sometimes make them come down. The more stones I threw the higher it flew,— and the faster. I counted four bushes I ran into the first day I tried to capture one. After that I lost count and patience too. It is a large yellow butterfly with black stripes on its wings. It has a wing expanse of three to five inches. Dr. Holland terms it the "Lordly Turnus". In the south it is diamorphic, that is having two forms in the female sex. These were at one time thought to be different species until a test was made. The eggs procured from a yellow female produced black females and vice versa.

A very common butterfly here is the Eastern Swallowtail (Papilio asterias). The larva is often found on parsley, fennel and related plants. It can easily be detected by the strong odor of fennel it emits when approached; a means of defense. I can always trace one to its hiding place by the odor. The perfect insect is subject to considerable variation.

In the yard of a mill along Cooper River there are some Ailanthus trees which were completely defoliated by the larva of the Philosamia Cynthia. I used to pass that way frequently, look up at those trees and shiver,— for I will confess I used to be afraid of "worms"— then look again thoroughly fascinated. The larva always seemed to feed on the under side of the leaves. I am not afraid now for I know the insects. They are perfectly harmless. People who have not made an acquaintance with them have many wrong ideas about them. Last summer someone found a "Hickory Horn Devil" and took it to the Academy of Natural Sciences, gleefully thinking he had discovered the cause of infantile paralysis. The Citheronia regalis, or "Hickory Horn Devil," is truly a fierce looking fellow. The big white spots on his sides, outlined on top with black and the big horns on the head are truly fear-inspiring and it would be easy to think him guilty of any sin. But how unjust! It is a thoroughly harmless and innocent insect, but like a full-blooded bulldog, so ugly that it is beautiful.

To go back to the Cynthias, they are the makers of the strongest silk among all the silk-worms. Some scientists claim they are the makers of our future silk supply. As yet there is no satisfactory machine for carding the silk. The Cynthia moth is a native

of China. It is one of our most beautiful moths. The wings are brown in color, just dusted with yellow. The tips of the forewings have a beautiful lavender color. In the centre of each wing there is a translucent crescent spot.

The Samia Cecropia is the largest of the silkworm moths in this part of the country. A number of cocoons gathered during the first year of my search for them produced most beautiful insects — the largest having a wing expanse of six and one-half inches.

I have spent much time looking around honeysuckle vines for a day-flying moth, the Eight-spotted Forester (Alypia octomaculata). For a long time I was not successful. The first one I ever saw was sent to me by a friend who captured it on a grapevine. The little brown banded caterpillars that are such a pest to honeysuckle and grapevines are the larva of this very beautiful little black velvety moth, which has a spot of lemon on each wing.

The first Silver-spotted skipper (Epargyreus tityrus) I ever saw was brought to me by my daughter's playmate, Anna M. Her mother found it on a rose bush in her yard and caught it in her hand. Anna brought it to me on a saucer covered with a tumbler. Her happiness was contagious. Why not? Dr. Scudder tells us that it is the only American insect that attracted the special notice of Agassiz. Its movements are very active and I marvel that it could be captured without a net. It has dark brown wings, the forewings being marked irregularly with yellow bands across the middle. The under wings have an irregularly shaped marking of a large silvery white spot.

There is a great incentive to hunt for butterflies for they are found wherever plant life is suited to the nourishment of the caterpillars. Some are found on tops of high mountains where an Arctic climate prevails. The number of species of butterflies and the number of species of birds are very nearly the same. Nature lovers find beauty, inspiration and health in the big out-of-doors. What can offer more real pleasure than a day out-of-doors, drinking in the beauties of nature and filling the lungs with pure, fresh air? But one soon tires if there is not some object in view, something to hold the thoughts, something to pursue. The entomologist on his out-door trips always finds much to attract his attention and inspiration to go on, and best of all a reward for his industry.

The Country Girl's Creed

JESSIE FIELD

In charge of the Neighborhood Club Dept. of Farmers' wife, U. S. Dept. Agr.

I am glad I live in the country. I love its beauty and its spirit. I rejoice in the things I can do as a country girl for my home and my neighborhood.

I believe I can share in the beauty around me; in the fragrance of the orchards in spring, in the weight of the ripe wheat at harvest, in the morning songs of birds and in the glow of the sunset on the far horizon. I want to express this beauty in my own life as naturally and happily as the wild rose blooms by the roadside.

I believe I can have a part in the courageous spirit of the country. This spirit has entered into the brook in our pasture. The stones placed in its way call forth its strength and add to its strength a song. It dwells in the tender plants as they burst the seed cases that imprison them and push through the dark earth to the light. It sounds in the nestling notes of the meadowlark. With this courageous spirit I, too, can face the hard things of life with gladness.

I believe there is much I can do in my country home. Thru studying the best way to do my everyday work I can find joy in common tasks done well. Thru loving comradeship I can help bring into my home the happiness and peace that are always so near us in God's out-of-door world. Thru such a home I can help make real to all who pass that way their highest ideals of country life.

I believe my love and loyalty for my country home should reach out in service to that larger home that we call our neighborhood. I would join with the people who live there in true friendliness. I would whole-heartedly give my best to further all that is being done for a better community. I would have all that I think and say and do, help to unite country people near and far in that great Kingdom of Love for Neighbors which the Master came to establish — the Master who knew and cared for country ways and country folks.

Nature-Study in The Rural Schools

Extracts from letters from Rural School Teachers to Edward M. Tuttle, Professor of Rural Education at Cornell University

Published in the Current Cornell Rural School Leaflet

"I have learned that the more we can find to do for nature-study or any of the agricultural or home making pursuits, the better the work in the other subjects becomes. As yet the community has shown little interest in the work done by the school, for only one family in the district shows any interest in the school anyway. I think we can wake the rest up later after the work gets out of the pioneer stage a little more."

"My nature-study class is held in the last fifteen minutes before noon, and the whole school is included. I found this subject difficult to grade, so all learn from one another and from Mother Nature all together. This class is usually a conversation period, but nature-study is not confined entirely to this time, for we discuss a subject whenever it is brought up whether that be during recess or drawing class. If any one has anything to prepare before class it is usually I, but I also try to ask questions or suggest a topic that will lead the pupils to find out something for themselves before the next recitation.

We often take a trip afield. And where can nature be studied to better advantage? This need not be a hilarious expedition with nature farthest from the children's minds. If a little forethought and care be used by the teacher, it can prove most helpful."

"I am convinced that nature-study is one of the greatest helps in discipline. Through nature-study you have something with which to keep the pupils always busy, as there is always something more they wish to find out about, and this keeps them out of mischief. I believe in it because it has helped me to reach children when everything else has failed, because it acquaints them with nature, which every day presents some new and interesting fact.

I have no prescribed outline that I follow. I tried that and failed. I always use the object itself if possible. I try to arouse the pupils' interest so that they are anxious to learn more. We use text-books only when unable to find out from nature

herself. It makes the other work more interesting. In fact every lesson becomes a nature-study lesson more or less.

The season guides me somewhat as to the right time to take up a subject. When some special interest has been manifested in anything, it is a good time to take up that subject. Only experience has taught me the right way to present a subject. You must study conditions and the attitude of your pupils. Feel your way and proceed carefully or your efforts are lost. I have failed when I have required lessons studied from books."

"I am a great lover of nature myself, and I naturally delight in teaching little children to love her. I think that nature-study has had and will have more to do in forming good, clean lives for the men and women of tomorrow than any other subject ever taught in the common schools. It is also helping to solve the problem of keeping the boy on the farm. The farmer of the future will have a greater knowledge of the wonders of the great out-of-doors than his parents had. He will have time when plowing or doing other work on the farm to examine weeds, insects, birds, and other natural objects, and will stop to think whether or not they are injurious.

As to the right time to take up the topic — whenever specimens are brought in, is the time to discuss them. If a question is asked on some nature-study or agricultural problem, it should be answered at once if possible. It should certainly not be shoved entirely aside. In this case the interest of questioner and listeners may be lost. In my school, if something is brought in with which we are not familiar, we search for all information we can find on the subject. All other school work is improved because of this. If called from their work to observe perhaps a bird feeding on some near-by tree, the children return to their other work with keener minds."

"I teach the lesson by asking questions and supplementing answers by explanation. Whenever we can, we find our answer from the specimen. On many succeeding days I ask who remembers that special plant or bird or insect and what they can tell about it. There is always great interest. I believe that the person who compels pupils to learn long descriptions of natural objects or who reads pages of uninteresting description to them,

will not get interest, and that in this way the very object of this work, to encourage love of the out-of-doors, will be defeated.

We have a few minutes a day on our program for nature-study, but we are a very busy school and do not find it possible to have this every day. We have two kinds of nature-study lessons, the ones that come at the regular time with the specimens previously brought to the classroom, and those that come when we interrupt our program to learn about something of present interest.

One day just as we finished an English class, one of the boys saw several birds in the school yard. According to our custom the boy told me about the birds, and all the pupils passed quietly to the windows. There on the ground outside were eighteen slate-colored juncos. Many of my smaller pupils had never seen a junco so we had a splendid lesson. This spring four or five bluebirds came to the young trees near the school windows, and we took this occasion for a study of the bluebird, for we had been watching for the bluebird for two weeks. Among the things of interest in our schoolroom just now are several branches of trees having egg clusters of the apple-tree tent caterpillar and several strange kinds of cocoons, all of which we are watching develop.

We have enjoyed all our school work very much, finding so much interest in all our nature work that it is not easy to tell what thing in nature had been most interesting. I wish to say for the benefit of teachers who may find this letter too optimistic that we have had the same hard work and routine and discouragements that come to other schools. I believe that a *little* well done will be an inspiration to both teacher and pupils. Any teacher who is not much interested in this work will find new interest and a new depth of vision to her own life if she will make ever so small a gift of whole-hearted time to it."

"I have found that through the study of nature we become acquainted with the real child and at the same time form a bond of friendship between pupil, teacher, and parents, which is very essential.

On the way to school and when we reach school, the children and I talk about the topics that they themselves have given me. I often direct them to books and ways of finding more about the topic under discussion; then we sometimes wait a couple of days so that they may look up facts before we take up the topic more

fully again. Whenever it is possible, we learn from observation. The other day while talking about the robin, the question arose as to whether both birds or just the mother bird sat on the eggs. Some already knew, but those who did not are going to try to find out from observing the robin. In this same way we take up many topics."

"The people had an idea that nature-study was all humbug, and were rather skeptical about it, last year especially. But when we began the study of rations and weeds, they changed their minds. I must tell you of an incident that happened this fall. We were in my father's meadow identifying weeds, and the children were writing about them in their tablets. An old gentleman drove along the road, stopped, and cried, "Hey, kids, where's your teacher?" I went down to see what he wanted, and he asked me what nonsense we were up to. I explained to him, and he said that I couldn't fool him, he knew very well that the kids didn't care about the weeds, but only waited till my back was turned to play with each other. Well my back *was* turned, but the children kept on with their work, and soon moved to another weed. We could hear their excited chorus of "Here's some chickweed!" "What are you talking about! That's purslane!" and so on. The old gentleman was very much surprised, but said that he guessed that children had changed some since he was a boy. I don't think they have, do you?"

"I realize now that pupils will not learn nature-study unless they are interested and have the object at hand or are acquainted with it in some way or other. I used to teach it as I did other lessons and at stated periods, but found that my pupils never seemed to know anything about what I taught. Now I find that they usually know more than I do. Nature-study does not become monotonous if it is varied by drawing and writing in place of talking.

Books used after the child has found out what he can by himself about the subject, prove most interesting to him and tell him many things to which he would pay little attention if read before. I do not think that we can give a lesson from a book on nature-study and expect a child to remember as he would learn and remember from nature specimens, nor is it so broadening."

A Terrarium in a Rural School

"The study of nature brings the school and the home closer together. In nearly all cases the parents feel that the children are learning something worth while, something that will always be theirs and that will help to make them useful men and women."

"The first nature-study we did this fall was on leaves. On Columbus Day the children all wanted to come to school so we took a good share of that day for an organized field trip. We started out with paper and pencils, and each child old enough to write put down the names of trees as I pointed them out. We saw thirty-two different kinds, fruit, roadside, field, and forest trees. One boy thirteen years of age knew twenty-nine, another, twenty-seven, two, twenty-five, and so on. Only a few knew less than twelve. One boy eight years old knew twenty-one. I have never gone on a trip with children before that was so successful. Of course, we pointed out important characteristics as we identified the trees. The boy who was most disinclined to take pencil and paper has asked to do the same thing again. I think that we shall, too, when the leaves are all gone and again when they are budding in the spring, but we shall go in different directions from the school.

The terrarium was made to fit a window sill. The two long sides of the glass, the ends and the cover of wire netting. It contains about three inches of good soil. In one end is a sunken dish for water. We sow grass seed as soon as school opens in the fall, and it grows all winter.

At various times we have had snakes, toads, tree toads, turtles, lizards, beetles, katydids, cicadas, June bugs, dragon flies."

The calendar sparkles with days that have brought
Some prize that was longed for, some good that was sought:
High deeds happen daily, wide truths grow more clear—
"Each day is the best of somebody's year."

Priscilla Leonard

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

The Rural School

There is much discussion these days about the inefficiency of the Rural Schools as compared with the graded schools of the village and city; much talk of the low wages given to the rural teacher and of the hopelessness of expecting efficiency under the circumstances. In many states special ways for improving these schools have been devised by the State Departments of Education such as the District Superintendent system in New York.

We have never quite agreed with the general verdict against the Rural School for the very good reason that having received our early education in this venerable institution we have never underestimated its value.

There have always been in the Rural School certain conditions ideal for the best education,— the two most important being opportunity for initiative on the part of both teacher and pupil. What mattered it to us if we had four teachers with no special powers of initiative when the fifth one had so much that we sped along the path of learning for four terms through the impetus which she had imparted to our own powers of initiative! We never talk to the pupils in the graded schools about their studies without thinking of the blissfully free way we graded ourselves in those old days. We "went into" our fifth reader, the highest in school, when we were eight years old; and we did "go into it" with a will, for reading then was as it has ever been since a joy and a resource; and at the age of nine we were struggling, zealously

and proudly with slate-full examples in compound fractions; and having committed to memory all the rules, we finished English grammar once for all at the advanced age of eleven. All of which achievements would convict us through the words of our own mouth — in the opinion of a modern pedagogue.

However, one great fundamental fact remains: Our lessons were a pleasure because there was no limit put upon our achievements,— there was no reason why "we should not arrive as fast as we could get there." Thus it was that we did not grow in graded sections but waved our shooting branches in any direction where we found sunshine and a chance.

What a long line of teachers they were, and how they stand fast in memory! Almost all of them were admirable for some qualities which child hero-worship found worthy; and there were heroes among them too! Could we ever forget the young man who taking the shawl which he wore instead of an overcoat, from his own back held it before the faces of four of us little folk and thus walked backward through a fierce blizzard a quarter of a mile to the nearest farmhouse, meanwhile freezing both his hands! There was an artist among them too, who taught us to love the beautiful in nature, she being the most beautiful creation of all. There were orators and poets who taught us to speak and to read what had been written in our literature; and there were those who reached out into science and taught us to reverence the stars.

The old school house itself we loved although it was not a beautiful structure. It stood on the crest of a hill so high that sometimes the clouds came down and played with us; and from its windows we could overlook broad valleys on three sides, and thirty miles away along the horizon was blue Lake Erie studded with white dots which we knew were sailing ships. To be sure, the benches and desks bore the escutcheons of the former occupants but we liked them all the better for that; ours had on it M. E. B. the initials of a rosy-cheeked sweet faced "big girl" who graced the place only a year or so after our advent; she was wont to wear a broad leghorn hat trimmed with blue ribbon a long piece of which was fastened to the front of the band, its free end being held in the hand of the fair wearer to keep the hat from being swept off by the wind,— a coquettish device that en-

hanced our admiration for the young lady and made the M. E. B. on the desk a starting point for dreams.

All of this was in a school of half a century ago; but our faith is still pinned fast to the Rural School. It was only last month that an enterprising and efficient District Superintendent invited us to a meeting of his rural teachers in Northern New York, an experience that renewed our enthusiasm for the "district school." The teachers present were bright faced attractive girls and women; they were alert and interested in all that pertained to their work and we envied the country youngsters who came under their instruction and influence; and we envied each of those teachers for she was teaching in about the only place left in our wonderfully organized educational system where she might have full opportunity for free, personal and friendly contact with her pupils and where her individual initiative might find fullest scope.

"On the bench by the woodbox was set the water pail. Beside it was the drinking utensil, sometimes a tin cup, sometimes a glass tumbler, and for one while a little custard cup. It was astonishing how many times a scholar could drink that custard cup full when he made the attempt. The small boy in the front seat would drink as much as he could hold, and then turn around and watch the progress of the water pail to observe if any one could exceed him. If the pail-bearer had a grudge against any particular one, or was humorously inclined, he might snatch the cup away before the drinker had taken more than a mouthful or two, or would give the cup a gentle but sudden tilt that inundated the drinker in a small way. The office of water-passer seemed to be quite desirable, and "May I pass the water?" was a question which required frequent answer from the teacher. The water was brought from the nearest neighbor's. A big boy could get it alone, but usually two went to carry the pail. In the interregnums between the wearing out of one pail and the getting a new one the scholars all raced over to "Uncle Elijah's" each recess to refresh themselves at the tub of running spring water which stood at his back door."

CLIFTON JOHNSON in *The Country School.*

News Notes

NEW YORK

Chautauqua Institution

In spite of war conditions the enrollment in the Natural History department of the Summer School at Chautauqua, N. Y. was practically the same as last year. Certainly there was no dimunition of interest and enthusiasm. The courses were conducted by Professor Vaughn MacCaughey of the University of Honolulu and by Miss Emma Davis of Johnstown.

As usual the work offered was a Course for Teachers of Nature-Study, a Nature Lovers' Course, Bird Study and an Evolution Course. In the first course Miss Davis emphasized the methods of presenting subject matter to classes while in the second Professor MacCaughey stressed familiarity with the materials of nature-study for one's own spiritual growth and pleasure.

Once a week as is her custom Miss Davis gave a demonstration lesson in the elementary school.

The bird classes had daily field trips for ear and eye training and a short series of indoor talks on bird life, the food, plumage, etc.

Perhaps one of the most attractive features of the department was offered in the week-end hikes and camping trips to representative natural history regions in the vicinity of the Lake. To equip for these the young women carried with them a blanket roll and provisions for four or five meals. The party usually left the Assembly grounds in the morning, riding, tramping and camping by turns and returning the following afternoon. The cooking was done in the open and at night a cheerful bonfire around which the campers gathered for stories and readings contributed much to the enjoyment of the trip, after which to roll in a blanket and sleep under the stars was the last delightful experience of a day quite new to many. In this way the deep gorge of Chautauqua Creek, the interesting old port of Barcelona on Lake Erie and a number of other points of interest were visited.

On the whole the summer has been one of marked success and happiness.

MASSACHUSETTS

New England Federation of Natural History Societies

The fall meeting was held in Springfield at the Museum of Natural History, September 20–21, by invitation of the Allen Bird Club. The announcement indicated real enthusiasm and that much was accomplished. It is given below.

"Friday evening September 20, there will be a public meeting at the museum lecture room at which there will be several addresses on the work of the Federation, the Allen Bird Club, and other Natural History organizations past and present, in Springfield.

"Saturday morning there will be an excursion, or several excursions, into the country for observation and collecting and members from outside the city are advised to come on Friday so as to be in time for these outings. It is expected that several members of the Boston Mycological Club will be present and assist in making a collection of mushrooms to be exhibited in the afternoon."

PENNSYLVANIA

North East

Miss Laura Selkregg is now president of the Nature Club, with Mrs. M. H. Benedict vice-president and Miss Ruth Porter secretary-treasurer. The meetings are held at the home of Mr. L. B. Cushman and seem to be full of interest. Mr. Cushman contributes the following on the Paper Wasp.

Nature Notes

By L. B. Cushman

Should you discover that hornets have built a paper nest under the eaves of your house or in some other location near by, don't make a fuss and set about devising some plan to destroy them or wreck their home, as I have known people to do, but consider yourself fortunate, for these "wolves of the air" feed largely on house flies and other pestiferous insects, thereby contributing directly and materially to your welfare. They rarely attack a person unless it be in self-defense. It is a cowardly animal that would make no effort to save its home in case of attack. Kill these hornets or drive them away, and you give flies and other obnoxious pests a better opportunity to increase.

If you see a hornet in early spring, you are safe to conclude it is the queen that has weathered the storms of winter and is casting about for a place to establish a colony for the summer. Her house will at first be small, perhaps not more than two inches in diameter — simply big enough to accommodate the first brood, which is never large. As the colony grows, more room is needed for brood cells, and this is cut out from the inside. The outside is added so that the proper thickness may be maintained.

The comb, like the rest of the nest, is made entirely of paper, as they store no honey, and consequently need no wax. The paper is made of weathered fiber of wood, mixed with saliva and chewed. This fiber is a wooly substance, and is obtained from dead trees that have shed their bark, from old unpainted buildings, from old fence rails, etc. In the fall they leave the nest, and none but the queen survives the winter. The abandoned nest of a flourishing colony is often a foot in diameter.

Years ago, when muzzle-loading shotguns were in use, a hunter considered himself fortunate to find one of these nests. They thought gun wads made of them were superior to those made of ordinary paper.

The hornet is your friend, He works for your interest every day, and works without pay. Preserve him as you would a toad. No one but an untrained child or a fool would injure a toad.

CALIFORNIA

California Nature-Study League

Reprints from the *Sacramento Bee*

From California Nature-Study League. (Care of C. M. Goethe, 720 Capital National Bank Bldg., Sacramento.)

With vacation time near, many children throughout California are busy making butterfly nets, looking forward to the fun of making insect collections.

They enjoy this much more when they make their own nets from a sawn broom handle, then a bit of wire twisted into circular shape serves for the rim if a hoop is not obtainable. This makes an excellent net frame. One and one-half yards of butterfly netting to complete the net need be the only expense. More children know how to make butterfly nets than understand the making of killing bottles and of pinning blocks for the pinning specimens. Some of the clearest information obtainable on the collection and preservation of insect specimens is to be found in the chapters on these subjects in Dr. Comstock's "Insect Life."

The war has taught us so much about food conservation that all America is awake to the fact that no child's education is really complete without several years of vacation collecting and learning the difference between beneficial and injurious insects. One of the best books obtainable on this subject is "Beneficial and Injurious Insects of California" by Essig.

Any one of the 2141 branches of the California County Libraries will give advice as to obtaining books on nature-study for the child learning to read a roadside as he would a book.

From California Nature Study League. (Care of C. M. Goethe, 720 Capital National Bank Bldg., Sacramento.)

Poisonous Buckeyes are Cousins to Nuts Germans Use for Food

Filtering across the Swiss border comes the report that starving, yet efficient Germany is utilizing the food content of the horse chestnut, having found a way to neutralize its undesirable portion.

In doing this, the Teutons are repeating California Indian history. In times of famine the Diggers made use of the buckeye, the California cousin of this European horse chestnut. The meat of the fruit or nut of our native tree, if eaten, is poisonous.

The Indians, with their wonderful mastery of their environment, had, under pressure of hunger, learned how to leach out this poison, leaving a satisfying residue, appetizing to the famine-stricken.

The submarine and camouflage have their counterpart in the insect world. Children exploring ponds and creeks for animals for their aquarium circus often find a mud colored monster with an almost uncanny extension jaw. This common dweller below the water is the larva of the dragon fly. When an adult, it earns the name of "Swiftest of winged creatures." Then it is bedecked with flashing sapphire, emerald or garnet. In its nursery in the mud, however, its dress is camouflaged and is the color of the muck in which it awaits its next meal. Children delight in watching it use its extension jaw, which it shoots out to seize unsuspecting prey.

Every child should have an aquarium with such occupants as the larvae of the damsel fly and of the dragon fly. One needs only a glass fruit jar, a handful of sand, and some clear water. Children learning to read a roadside as they would a book will find few things more interesting than such an aquarium stocked with catches made while exploring roadside pools or creeks. Full aquarium directions are to be found in the chapter of "Breeding Insects" in Dr. Comstock's "Insect Life" to be had from most of the 2141 branches of the California County Library System.

RHODE ISLAND

Camp Chequesset

The fifth season of Camp Chequesset, a "Real Camp for Real Girls" at Wellfleet Bay, Cape Cod, has certainly been a genuine contribution to the growing movement of making young America healthy and happy. And at the same time there has been direct, immediate help in winning the war. We are more and more coming to realize that in the boys and girls of this nation lies the hope of the whole world, and that anything which develops them, physically, mentally, and morally is essentially patriotic. That is just what Camp Chequesset is doing.

Thirty-four girls from many parts of the country spent a happy summer doing and learning many things which bear directly on high ideas. The camp is conducted by Mr. W. G. Vinal, instructor in Nature Study in the Rhode Island Normal School. Miss Alice H. Belding, Director of Physical Education at Randolph-Macon Women's College, is also one of the camp leaders. Mrs. Vinal is "camp mother" and gives it the home touch. She is a graduate of the Bridgewater Normal School. There are several other leaders, including Capt. Wm. Taylor, "Graduate of the School of Hard Knocks in Cape Cod Bay."

The camp life is varied, including all forms of athletics, hiking, swimming, semaphore and folk dancing. The fields and forests and sand dunes as well as the fresh and salt water afford endless opportunity for real nature study.

The honor chart shows much interest in the activities with cups and medals given for excellence. Miss Elizabeth Acheson of New Jersey, won the silver cup for Nature-Study, which included flowers, birds, trees and shells; while another young woman "won 18 pounds in weight and gained a ruddy hue." Safe to say there were many competitors for the last honor.

The War Service Calendar sent to each camper recently shows that these girls, besides knitting 70½ pairs of socks, collecting sphagnum moss for the Red Cross, and selling $300 worth of War Saving Stamps, earned $162.90 during the season to be divided between the Red Cross and little War Orphans in France. They did it by "shouldering the hoe," picking berries, and digging clams.

Surely this camp may well be called a Laboratory for Human Nature-Study, the very highest kind of nature study. Long live Camp Chequesset!

The Rhode Island Field Naturalists' Club

The autumn program might well serve as a model for other clubs. Its *Itinerary* and *Suggestions* and *maxims* for members makes one hungry to belong to just such a club. And we like the service flag for Private John W. Russell now in France. The club publishes a *News Letter* sent to all members which shows the fine spirit of all who belong to it.

Itinerary

I. Sept. 7. Title Rock. Rehoboth. Leader, Miss May Merry. Mrs. Frank Goff, hostess. Taunton car fron east end of Post Office, 1.35 P.M.

II. Sept. 14. Papoosesquaw Neck. Colt's Drive. Leader, Mrs. Harriet P. Church. Bristol car from Union Station, 1.15 P.M.

III. Sept. 21. Franklin. Ellerslie Farms Dairy. Leader, Miss Lila Hurley. Guide Master, Hugh Henry Swanson. West Wrentham train from Union Station, 12.15 P.M. Carry lunch. Transportation arrangements make it necessary to notify the Leader by the 14th if you plan to go.

IV. Sept. 28. Auburn. Insect Study. Leader, Mr. Martin Bowe. Auburn car from Exchange Place Waiting Station, 1.20 P.M.

V. Oct. 5. High Rock. A study of Hemlocks. Leader, Mr. Royal P. Richardson. Meet Exchange Place Waiting Station, 1 P.M.

VI. Oct. 12. Gaspee Point. Commemorative of Columbus Day. Leader, Miss Adelaide Patterson. Buttonwoods car from Union Station, 12.48 P.M.

VII. Oct. 19. Oaklawn. Geology. Leader, Miss Marion D. Weston. Oaklawn car from Market Square, 1.30 P.M.

VIII. Oct. 26. Lincoln Woods. Juvenile Nature Study. Leader, Mr. William G. Vinal. Bring as many children as you will look out for. Smithfield Ave. car from east end of Post Office, 1.15 P.M.

IX. Nov. 2. Skeeterville and Moswansicut Pond. Leader, Mrs. Alice F. Porter. Chepachet car from Exchange Place, 12.53 P.M.

X. Nov. 9. An Autumnal Quest. Leader, Mr. Alvin N. Herrick. Meet Market Square, 1.10 P.M.

XI. Nov. 16. North Branch of the Pocasset. Minerals. Leader, Miss Eva W. Magoon. Danielson car from Market Square, 1 P.M.

XII Nov. 23. Hundred Acre Cove. Barrington. Leader, Miss Bertha M. Smith. Barrington train from Union Station, 1.15 P.M.

XIII Nov. 30. Turn O' Chance. Leaders, Prof. J. Franklin Collins and Willis E. Chandler. Meet at Exchange Place Waiting Station, 1.30 P.M.

Suggestions

In case of clearing weather on days when all-day trips have been cancelled, meet at Waiting Station, Exchange Place, at 1 P.M., to plan a substitute trip.

Be prepared to review with the leader at some time during the trip what has been noted of interest in nature study.

Courtesies to Leaders:

Keep up with the party. Follow the Leader's suggestions. Do not distract attention from explanations.

Maxims: Study nature afield. Collect outdoor records. Conserve rare plants Protect useful birds. Spread helpful knowledge. Scatter no rubbish.

Note

In these days of uncertainties, it is wise to look out for changes in time tables.

With the Colors
Private John W. Russell

Letters or cards from his fellow Club members will be appreciated.

Address him at Headquarters Company, 327th Infantry, 82d Division, American Expeditionary Forces.

ASTRONOMY NUMBER

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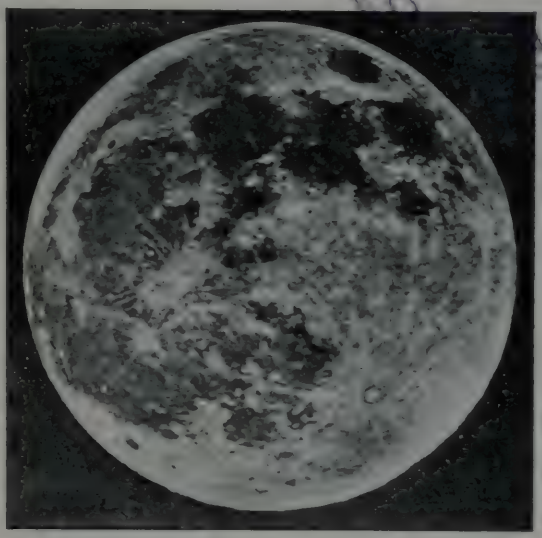

A photograph of the Moon

SOME OF OUR LISTS

AGRICULTURE
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GENERAL BOTANY
ENTOMOLOGY
EVOLUTION
NATIVE FERNS
NATURE STUDY
PLANT ECOLOGY
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LANTERN SLIDES

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The Moon Story

ETHEL HINCKLEY HAUSMAN
New Haven, Conn.

It is not many years since people believed that once upon a time, many millions and millions of years ago, a strange thing happened on this earth of ours. In those remote days our earth was not the hard, solid body that it is today, but was a larger, softer, and much hotter mass, too hot, indeed for any sort of life to find it comfortable to live on its surface. Great volcanoes, scattered thickly about steamed continuously and spouted their torrents of molten rock incessantly from out their giant craters, and clouds of mud colored steam hung over all the land. It was during these troubulous times that the strange thing of which I have spoken, occurred. A huge fragment of the earth's mass was broken off by the rapid rotation of the earth itself and was sent steaming and twirling away into space, gradually assuming a globular form as it went. It, too, developed volcanoes, and was clothed with clouds of steamy vapor, and was in fact a real daughter of our earth. But it gradually, like the earth, began to cool, until finally, when thinking human beings began to make their appearance on this world of ours they looked upward one fine moonlight night and exclaimed, "Look, what a wonderful moon!"

Perhaps this was the way in which our moon was born but astronomers of today have a new theory. By studying certain bodies in our heavens called nebulae they have decided that our world was formed from such a mass in the center of which was our sun and rapidly spiralling around it many smaller particles of different sizes perhaps in a liquid state but at any rate in such a condition that when a smaller particle strayed into the path of the larger ones there was a collision and the smaller one became joined to and increasing still more the size of the larger. So it was that our earth and other planets including the moon were born.

Astronomers tell us that the moon is about one-eightieth the size of the earth. If you were to make a trip around the earth, in the region of the equator, and then repeat your journey again and again for ten times you would have travelled as far as the distance from the earth to the moon, or about 238,840 miles. We usually say about 240,000 miles, as this is an easier number to remember. So you see the moon is really quite far away, and yet it is our nearest heavenly neighbor! Not a very neighborly distance, is it, as we think of neighborly distances in our towns and country-sides? If you were to travel on the fastest express train, and could go a mile a minute, and never stop for any station, or slow up for any grade, you would have to travel for 166 days at this top speed before you reached the moon. And 166 days, remember, is almost half a year! The moon, as you probably already know, travels around the earth once every month, and in a great circle, but not an exact circle. Sometimes the moon's orbit (as this path around the earth is called) lies nearer to the earth than at other times, and so when the moon is in this particular portion of its journey it approaches to within about 210,000 miles of us. Still this is not near enough so that we can tell the difference by merely looking at it. It is the astronomers who work these things out for us, using, such very, very hard problems in mathematics, which you and I, I am afraid, would not be able to do.

Because of its great distance from us the moon seems very small, but I am sure that you will not think that a globe with a diameter of a little over 2,000 miles is very small; and that is the diameter of our moon, or in other words the distance right through its center from one side to the other. Just remember this when you are next looking at the full moon, and try to imagine how very far away it must be to look no bigger than your tennis ball. Some of the planets (that is the heavenly bodies like our earth) have several moons! But if there are people on such planets, these moons seem to them no larger than many of the bright stars do to us.

The same surface or side of the moon is turned toward us always, so that when the moon is full we can see the Man in the Moon, or the more beautiful Lady in the Moon, in always the same positions. This surface of the moon that is visible from the earth contains 7,300,000 square miles. It will make these figures more

interesting when I tell you that this is just a little larger than the area of South America. Unfortunately we do not know what the other side of the moon is like, for we have never seen it. Isn't that curious? See if you can twirl an apple on its stem, and keep it, at the same time revolving about your closed fist so that the same side of the apple is always toward your fist. If you can do this then you will have some idea of why we earth people never see but one side of the moon. But the moon sways a little as it makes its monthly journey, just as though it were a little unsteady, perhaps dizzy as it looks so far, far down at the earth, and as it sways we see a little bit around first on one side and then on the other. From these glimpses we judge that the unseen side is very much like the seen.

The magical, soft, silvery moonlight, which we all enjoy so much is the light which the moon catches from the sun and reflects down to us on earth. For the moon itself is cold and solid and emits no light of its own, Like a great round, rough, silver mirror it catches what light it can and sends it earthward. If you will look very carefully when the moon is new, that is when it is merely a thin crescent in the western sky, you will see the faint outline of the whole big moon! This is what has been poetically called "the old moon in the new moon's arms." The faint outline that we see is illuminated by the reflected light from our own earth, or earth shine, as it was termed. For you must remember that to the moon our earth is also a moon, and shines almost fourteen times as brightly! If only there were people living on the moon, just fancy what wonderful "earthlight" nights they would be able to enjoy! How far the light rays or waves that illumine this faint ring of the "old moon" have travelled! They have travelled from the sun to the earth, across to the moon, and then back to the earth again. And if I tell you that the sun is about 93 million miles from the earth you can find out the distance which these waves have travelled. Try and see if you can!

Of course you know that the moon does not change its shape, but appears as a crescent, half, or full moon according to the amount of its surface that is lighted by the sun.

As has been suggested, it would be pleasant to think of children on the moon, and grown ups, too, all enjoying our earth shine, but alas, we know that there can be no children there, nor flowers, grass, trees, or life of any kind. Neither are there brooks, or

The moon's surface seen through a telescope showing the craters, Mercator and Campanus

ponds, or oceans that we earth folk know so well, and would feel so at a loss without. The moon is cold, dry, and solid, a mass of rock, of a grayish hue, much like, perhaps, a huge lump of dull silver. If you will take a pair of opera or fieldglasses, or a small telescope and examine the surface of the moon, the distorted face of the old man, and the beautiful profile of the lady vanish, and in their places appear mountains, plains, and irregular darker patches. This is the moon as the astronomers know it. Look closer, and you will see that the surface is covered with multitudes of little rings, some large and ragged, some small, perfect, and smooth. These are volcano craters, and many of them are much larger than any that we have on our earth, some being more than a hundred miles from side to side. The largest one that we can boast of, measures only seven miles! The irregular dark patches are the shadows of mountains, and it is by means of these shadows that astronomers measure the height of the

mountains that cast them. Can you think how this could be done? You will easily recognize the broad plains. The early observers of the moon, in the days when telescopes were small and weak, thought that these plains must be seas, but we know better now-a-days. There is no water on the moon, you remember. Strange as it may seem to you, every mountain range and crater, every plain and valley has a name! For the geography of that side of the moon which we can see was known and mapped long before the surface of our earth was studied. Why was this? Don't you see how easy it was for the early moon geographers to map the surface which they could see so well? To map the surface of the earth requires years and years of travel, and the early inhabitants of our world had not the great steamships, railroads, automobiles, and aëroplanes which we have to carry us rapidly over long distances. They knew very little of the surface of the earth on which they lived, because they had seen very little of it. But all of them had seen all of the moon that there was to see from where they lived, and without going any farther than, perhaps, their front yards!

Mountains and volcanic craters on the moon tell the history of terrific disturbances within the hot interior ages and ages ago, far more severe than we can imagine, disturbances which sent floods of boiling lava and showers of rock fragments and ashes out of the craters of multitudes of huge volcanoes, while earthquakes rocked the globe and raised the ranges of jagged mountains which traverse the face of the moon.

Now the moon is quiet, peaceful, cold, unchanging; clothed with no vegetation, and supporting on its rocky surface no traces of animal life. Year after year it silently rolls on through the dark and silent vastness of space, its chief duty seeming to be to give to us mortals the most beautiful silvery light which we know. The ancient alchemists sought to turn silver into gold, but the moon, well knowing that we have the gold of sunlight in plenty during the day, captures the gold of the sun, after it has set, and transforms it into silver for our delight during the night.

You know that our atmosphere serves as a blanket, both to prevent the escape of heat from the earth, and also to shield us from too much heat from the sun. On the moon there is no atmosphere—that is, no air—and so you can imagine how piercingly cold it must be when the sun is set, and on the other hand how scorchingly hot it is underneath its direct rays!

Besides giving us light at night, the moon, like a dutiful servant, performs for us other important services! It raises and lowers the waters of our oceans and seas by its attraction, thus giving to us the tides. Were it not for the cleansing wash of the rising and falling of the water twice a day you can easily see that our seacoasts would soon become unwholesome places through the decay of animal and plant substances. What a valuable service this is, to be sure! But the moon has a helper in this task, for the sun also aids in regulating the tides.

The forces of the attraction of the earth, as you know, is what gives to bodies their weight. This force is called gravitation. Now astronomers tell us that the smaller a heavenly body the less gravitation it possesses. The gravitational force on the moon is only one-sixth of what it is on the earth. That means that a body weighing sixty pounds on the earth would weigh only ten pounds on the moon! If you could go to the moon you would weigh only one-sixth of your present weight. What would you weigh there, Reader? How much farther you could jump there! And think of harnessing a Shetland pony to a great two-horse load of coal and seeing him amble away with it as easily as if he were drawing a basket-gig load of children to a picnic!

Truly the moon is a wonderful companion for us earth people, for even if we cannot make a visit to it at present (and who will say that a journey to the moon will never be possible) still it furnishes us with the only silver light that we have, besides presenting us with a wonderful landscape of mountains and volcanoes, and doing many little tasks for us, such as I have suggested in the matter of the tides.

The ancients regarded the moon as a symbol of steadfastness and unchanging devotion to purpose, and to swear by the moon has come down, almost to our own day as the custom of those who wish to give assurance of their loyalty and fidelity.

"A globe of silver on a velvet sky
Of sable hue, rolls slowly year by year
About our earth, and ever from on high
Sends down her argent light for mortal cheer.
Oh moon, throughout our life's short span, may we
Be firm, unchanging, constant, pure, like thee!"

The Moon, A Physical Geography Lesson

LENA S. THOMAS
Supervisor of Children's Gardens for the Carnegie Steel Co.
Duquesne, Pa.

Scientists have proved by photography, and observations through powerful glasses, that the moon has no atmosphere, and no atmosphere means no water, as well as no air. Let us consider for a moment what effect the lack of water and air would have on the vegetable, animal or human life of our own planet: Could plants grow without air? That is easily shown to be impossible by trying to grow a plant under a glass jar, from which the air has been exhausted, the plant ceases to grow, becomes stiff and finally dies. Do you think animals could live without air? Do you think you yourself or any one you know could live without air? Have you heard the story of the miserable prisoners in the dungeon called "The Black Hole of Calcutta," who died because they could not get air to breathe? We all know how we sleep with our windows open nights to get good air.

We all know that neither plants, animals nor people can live without water. So we must decide that the earth without her atmosphere would be an impossible place to live on. For the same reasons it is easy to see that if the moon has no atmosphere it would be impossible that there should be any form of life there.

We can make observations on the lack of atmosphere around the moon for ourselves with field glasses. If we observe an eclipse of the sun by the moon or see the moon passing between the earth and a star, we shall see that those bodies disappear sharply and reappear abruptly; there is no gradual changing of color nor softening of light. Scientists say this is due to the lack of any atmosphere such as the earth has; if there were any, during an eclipse of the sun by the moon the sun would not entirely disappear but would be revealed to us by a ring of dazzling luster, caused by the refraction of its rays by the air.

We should begin our observations of the moon through our glasses while it is a narrow crescent, and follow it as it fills, we shall be looking at the tops of moon mountains, which will be flooded with light as the moon rises, leaving the lower spaces buried in blackness; people can measure the height of these mountains by these great shadows, which are cast across the valleys.

In the full moon these shadows are shortened and the light places we see are the white shining rock of mountains while the dark places are rocks of a different color. The old astronomers gave them very fanciful names, such as the Bay of Rainbows, the Lake of Dreams. They did not know as we do now, that all these valleys, lake beds, or craters as they may chance to be, were without a drop of water.

We are told and it has been proven that our atmosphere is about 200 miles high, some parts of it being much thicker than others because it is compressible, pressing on us, as they will teach you in physics class, with a pressure of nearly 15 pounds to the square inch.

A good way to realize what it is like on the moon without any blanket of atmosphere is to know some of the things our cushion of air does for us. If we were to climb up some exceedingly high mountain, like Mt. Everest, or go up in an aeroplane we should find that the farther up we went the colder it would become; we should notice this more after we were above the clouds, for they act as heat curtains to us, keeping in the heat that comes down to us from the sun and acting at the same time as a screen to protect us from its scorching rays. Many a traveler's face has been scorched by the sun, even in those high places where the air is so bitterly cold. We know that water in a blackened bottle, has been boiled by the sun's rays at a height of about 1100 feet.

Now if through our air blanket 200 miles thick, we can be scorched by the sun, or frozen with the cold, how terrible it must be on the moon, which has no blanket of air, and no screen of clouds. The heat of the sun's rays is 500 degrees above zero, and they would fall on the moon five times hotter than they do here on the hottest day of summer when the thermometer stands at one hundred in the shade, and horses and people fall dead from sun-stroke. How long do you suppose they could stand the heat on the moon? Then at night because the moon has no blanket to keep the heat from getting away from her quickly, she cools down to 250 degrees below zero. This is cold enough to freeze air solid.

Here is a jar with an air pump, which I have borrowed from the physics department, it has a bell in it suspended from a string. Can you all hear the bell ringing? Now one of you may use this air pump and pump the air out of the jar; now ring the bell. What,

cannot you hear it ringing? Well do you think it is ringing? Why? Oh you see it shake do you? Well if you see it ringing why don't you hear it? Yes, because there is no air in the jar. Then it must be the air that makes us hear; if you think so let in a little air; sure enough, now you can hear it ring! So it must be the air that enables us to hear sound. Suppose you were on the moon, and one of you wanted to tell the other something. No matter how loud James should shout he could not make John hear; he might see James' mouth move but that would be all; James would have to make signs or write it. If all the battles of Europe could have been fought on the moon no one would have had shell shock from them. Even the meteors though some of them weigh a thousand tons do not make any noise when they fall into the moon; but they do batter its face terribly when they strike it for the moon has no cushion of air in front of her to protect her as the earth has.

All of us have at some time been in a darkened room, where through some tiny space would come a ray of light which would proceed in a straight line to some spot on the wall, where it would make a spot. If we had a prism somewhere between that opening into the room and that spot on the wall, anywhere along the line of light, it would strike the prism and be thrown back or refracted, but it would no longer be one bright spot but light scattered to all parts of the room; and it would no longer be white, but would show all the seven colors which we call the spectrum.

This is what our atmosphere does for us, it collects all the rays of white light that come to us from the sun, they pass through it and are scattered into all corners of the world and these rays of light strike on different objects, for example, the sunlight on the grass; and those rays which would look red or yellow or violet, are absorbed by the plant to do work for it, and only the green color is unused, or thrown back, refracted, to our eyes, and we see that and call the plant green.

The moon has no atmosphere to act as a prism and diffuse and color the sun's rays which fall on it as a strong white light, billions of times stronger than the little white spot you may have seen on the wall. It is so brilliant that we could not look on it without being blinded. We cannot look at the sun from the earth without hurting our eyes, but a smoked glass makes it quite easy. The atmosphere acts as a curtain something like the smoked glass.

Because the moon has no atmosphere, the stars seen from it do not twinkle for that is caused by seeing the light through the moving air curtain, like the little spots of dust we see dancing in the room between us and the window, in our own houses, or out of doors between us and the sun.

Scientists have proved that light consists of three colors, red, yellow and blue, there being three parts of the yellow, five of the red and eight of the blue, and these three colors make black. Our curtain of atmosphere sifts out the other colors, and leaves us a blue sky, but the moon having no such sifter, its skies remain black. People who have gone up very high in the sky, where our curtain was thinner, have noticed the sky became darker as they went higher. So our knowledge of this fact tells us that the moon sky must be black as ink.

There is always a shadow on the opposite side of any object on which light falls; but the atmosphere diffuses the light so that on the earth the shadows are not black; but on the moon there are no scattered permeating particles of light filling all the tiny cracks of space to lighten up things, so there the shadows are blacker than our blackest night, and all the moon is covered with them except in those places on which the light falls directly.

The atmosphere is an invisible blanket wrapped around the earth. As sometimes our blankets are made of a mixture of materials, so sometimes our air is a mixture and carries more water or less, according as to whether it is warm or cold. If the day be warm and dry, as it might be in summer, water from the oceans, lakes, rivers, ground or foliage, absorbed, is changed to vapor, which is a mixture of the hot air and the water; as more air is mixed in, all the water disappears in the air. We call this evaporation. The hotter the day the faster it takes up water.

But just as our regular blankets of cotton or wool can take up a certain amount of water and not drip, but will drip when they have more than a certain amount of water in them; so our blanket of air can only take up about seven inches of water at any one time, without dripping; although that air blanket is 200 miles thick.

If the sun is very hot all the moisture that is taken up may be carried up into the sky several miles, and spread out so thin that it disappears as gas leaving no clouds at all. But if a current of cold air comes rushing along from the north pole, or some other

cold place, then the water in the air condenses again and makes clouds.

Fog and haze are clouds. The haze is where the moist air is just a tiny bit cooled, and therefore the water is slightly condensed, this often happens when the sun is going down. If the air becomes still thicker, that is, has more water condensed in it, and we cannot see things around us, we say there is a fog. Fogs are more apt to occur where there is a good deal of dust floating in the air, since the mixture will condense into water around these tiny bits of dust. When the temperature of the atmosphere falls to a certain degree of coldness the air is unable to hold the moisture and lets it go as rain. But if it gets still colder, and the air is full of water it condenses into crystals and makes snow instead of rain.

Thus we see that the rays of the sun, before they fall on the earth and warm it, must warm all this blanket of air that is between us and it, and the air blanket because of the heat absorbs water and so, our weather will vary.

But on the moon, where there is no water to be taken up by the air and no air to take it up anyway the clouds cannot be formed nor changed from rain clouds to snow clouds, so the weather on the moon does not vary.

With no water inside the ground to freeze, and push the particles of rock apart, as the water swells in freezing, the rocks would not break up into little particles as they do on the earth, and therefore the rocks on the moon would probably stay rocks forever, instead of breaking up into soil, as they do on the earth, unless the meteors batter them into pieces.

QUESTIONS ON THE PHYSICAL GEOGRAPHY OF THE MOON

Do you think there can be any life on the moon? Why not?

What do you think the color of the moon's sky is? Why?

How does our sky look before sunrise, and at sunset? Does the moon's sky look the same?

If you were on the moon, how do you think the sun would look? How would the stars look? Would they look as they do from the earth? Why? What can you tell about the shadows on the moon?

If we had no air on the earth would you be able to guess whether the mountains were a long way off or close at hand? Why?

Is the climate of the moon like ours? How does it differ? Why is this difference? Could people live in such a climate?

What difference would the lack of an atmosphere make in our own ability to hear noise? Why? Does it make any difference on the moon? If you were there could you hear your mother call you to supper if you were playing in the next yard? Could you hear the roar of a cannon if there was one discharged on the moon? Why?

Why do we have clouds in our sky? What makes rain and snow? Why is our sky blue? Why is the moon sky black?

How do freezing and thawing affect our rocks? Is it the same on the moon? Could you go skating or slide down hill or make snowballs there? How would lack of clouds and air affect the heat and cold?

Ode to Phoebe

From *The Metropolitan Magazine*

Phoebe is the moon of Saturn which revolves in the opposite direction from all the other moons of Saturn and of all the other planets.

C. S. Day, Jr.

Phoebe, Phoebe, whirling high
In our neatly plotted sky;
Listen, Phoebe, to my lay,
Won't you whirl the other way?

All the other stars are good,
And revolve the way they should;
Only you of that bright throng
Will persist in going wrong.

Don't reply what God has said,
We have made a law instead;
Have you never heard of this
Nebular hypothesis?

It prescribes in terms exact,
Just how every star should act;
Tells each little satellite
Where to go and whirl at night.

Disobedience incurs
Anger of astronomers,
Who, you must not think it odd,
Are more finicky than God.

So, my dear, you'd better change,
Really, we can't rearrange
All our charts from Mars to Hebe,
Just to fit a chit, like Phoebe.

First Grade Readers

A Survey and Criticism

WILLIAM GOULD VINAL
The Rhode Island Normal School

ATURE-STUDY teachers will concede that first grade readers are not supposed to be nature readers or for nature-study. However, as the large majority of stories in these books are about plants and animals the books have a decided relation to nature-study. Librarians, kindergarteners, and literature teachers will not agree with this article. Their experiences certainly cannot be ignored. What position do science teachers take in regard to first grade readers?

The following statistics were gathered from thirty-three of the best and most used first grade readers. Over 50 per cent of the stories in these readers are about animals. Only 33 per cent of these animal stories are true to nature. The other 66 per cent are either fables or personifications where the animals act and talk as human beings. For every five animal stories there is one plant story and one geography story, such as:—The wind, the rain, or the Eskimo. Out of fourteen stories related to some special day nine are devoted to Christmas, three to Thanksgiving, one to St. Valentine's, and one to Hallowe'en. Only two books have any biography and these honor Dupré, Millet, Abraham Lincoln, Confucius, Washington, King Midas, and Columbus. The other subjects consist of a little fiction, such as:—Dolly's Ride, or Helping Father, and stories about inanimate objects, such as:—A top, a drum, or a sled. Only four books out of the thirty-three give any attention to our flag or to patriotism.

A study of the accompanying table will be of interest to all naturalists. For instance: The cat is written about more than any other animal. Out of thirty-eight cat stories fourteen are of the fairy type (includes myths, legends, mother goose, and fables), fourteen are about cats who talk as human beings, and ten are true to cats and their doings. It is only fair to state that the majority of these cat stories which cannot be classified as personifications or fables are of the following style: "See mamma.

TABLE SHOWING NATURE CONTENT OF THIRTY-THREE OF THE BEST AND MOST USED FIRST-GRADE READERS

ANIMALS					PLANTS					GEOGRAPHY			
Name	Total number	True to nature	Personification	Fairy Tale, etc.	Name	Total number	True to nature	Personification	Fairy Tale, etc.	Name	Total Number	True to nature	Impersonation
Cat	38	10	14	14	Apple	10	7	3	0	Snow	9	8	1
Dog	20	9	9	2	Maple tree	5	3	2	0	Wind	8	3	5
Cow	17	9	3	5	Daisy	4	3	1	0	Rain	7	4	3
Mouse	13	2	4	7	Dandelion	4	2	2	0	Frost	5	1	4
Hens	17	9	8	0	Seeds	4	3	1	0	Dutch	4	4	0
Rabbit	13	4	8	1	Seedlings	4	3	1	0	Eskimo	4	4	0
Fox	11	1	7	3	Leaves	4	3	1	0	Sun	4	1	3
Bee	10	2	4	4	Cherries	3	3	0	0	Farm	3	3	0
Horse	10	8	2	0	Orange	3	3	0	0	Moon	3	1	2
Pig	10	3	2	5	Pussy Willow	3	3	0	0	Cloud	1	1	0
Squirrel	10	3	7	0	Milkweed	2	2	0	0	Japan Girl	1	1	0
Chickens	9	4	5	0	Oak	2	1	1	0	Spring	1	1	0
Robin	6	4	2	0	Tulip	1	1	0	0	Wool	1	1	0

SUMMARY:	Total	True	Personification	Fairy Type	Books*
Animals	339	120	126	93°	33
Plants	79	57	22	0	17
Geography	63	41	22	0	18
Special days	14	14	0	0	10
Biography	6	6	0	0	2
Our flag	4	4	0	0	4

*Indicates the number of books out of the 33 examined in which these kind of stories appear.
For example: The 22 personified stories about plants occurred in 17 books.

See kitty. Mamma, see kitty. See kitty, mamma. My kitty. See my kitty. See my kitty, mamma, etc." As soon as possible these books launch out from this stage into cat-lore,—"Ding, Dong, Bell;" the kitten-mitten episode; the Pussy Cat and the Queen; etc. There is an intermediate stage of true stories which is omitted. What has been said about the cat is typical of other animals. One must conclude that the "True to Nature" stories are of rare occurrence in first grade readers.

The child's written composition is too often a reflection of his reader. It should be vice versa. The method of the teacher is also influenced by the method of the readers. This influence permeates the primary grades and the following essays written by primary grade children represent the work of three different teachers and three distinct methods.

1. *Golde rod.* "My name is goldenrod. I live by the side of the road. I have purple aster nearby. I am dressed in yellow. It is like the sun. My friend has a purple and yellow dress. I have a lot of gold-dust. I come in the autumn when the trees are turning brown and yellow. My leaves are green and narrow." This teacher saw nothing interesting in goldenrods and had had no scientific training. The child did not learn anything about goldenrods. The plant was humanized. Nature is interesting enough in itself and needs no fluffiness.

2. *Nasturtium.* "My flower has a green stem. My flower's name is nasturtium. It has petals and is yellow and brown. It smells nice. My flower grows in my garden. Bees go in it. They make honey for us. There is some honey in the end." This paper is a decided advance over type one. The plant has a relation to the life of the child. Each flower fact however, is isolated and has nothing to do with the life of the plant. Bees do not gather honey. They gather nectar to make honey.

3. *Dandelion.* "The dandelion grows in the meadow and on the lawn. The root is long so that it can get the food in the ground. The leaves are pointed. It is called the dandelion because the leaves are like a lion's tooth. There are many dandelions because when the lawn mower goes over them it cuts the leaves but it does not hurt the roots. The animals do not eat them because they are too bitter." Although there is much that could be improved in a second draft the results attained in this composition are very creditable. This pupil saw a relation between the

form of the plant and its life. The facts have a meaning. The adaptation of a plant or animal to its environment should play an important part in every story of its life. It is this form of story that is lacking in the first grade readers.

What literary development has the child at the end of the first year? He has had a year of exciting reading. He probably prefers this style, but, does that make it right? Most children prefer candy but we do not make it 50 per cent of their diet. Is "ding dong bell" the means or is it the object of education? Education is a process of living. The child lives with a cat that catches mice and laps milk with its rough tongue. These every day subjects of child life are natural, fundamental subjects. It is sort of a "See America first" idea. Why go by the fable-route to tell about interesting things at home?

If the child does not get true stories now, when will he? The majority of children never will get true animal tales. The only ones I know of, about cats, are the leaflets written for the Humane Education Society and many of these are the "Do not tie a tin can on the cat's tail" kind. (It would be better pedagogy to get an interest in cats.) The writers of real nature literature may be counted on one's fingers. They are Bradford Torrey, Frank Chapman, Ernest Ingersoll, Dallas Lore Sharp, Gilbert White, Henry D. Thoreau, and John Burroughs. And, after all, were not our great writers worth while naturalists? Emerson, Longfellow, Whittier, and Tennyson were not nature fakirs. What has a child in his early literature to prepare him for these writers? Nothing. His early training prepares him to make such books as Long's and Seton's successful. These writers tell about animals, not as they are but as their readers like to think they are. I well remember my bitter disappointment in the learning powers of two pet rabbits after having read about rabbit intelligence as "observed" by these two men. The average first grade reader is the initiator of the appetite which enjoys nature faking, the colored supplement of the Sunday newspaper, and shall we add, ante-nuptial love stories,—situations remote from real life.

The existance of gullibility as to fairy stories was illustrated in class recently. I asked how deep in the ocean are growing plants found? The answer was rather fabulous. Questioning brought out the information that the pupil knew it was so because she had read about it in Jules Verne's "20,000 Leagues Under the

Sea." The pupil did not know the meaning of a league but on looking it up returned with the same amount of credulity even though 20,000 leagues means 60,000 miles and the diameter of the earth is about 8000 miles. Any one entertaining any doubt as to the universal faith in such matters should question farmers in regard to the Old Farmers' Almanac and their belief in weather folk-lore.

The reasons given for the fairy-land route are more traditional than real. The supporters might as well say,—"The more remote an idea is to the life of a pupil the greater is the value of the idea". One purpose of the fairy story is to teach a moral truth. I would give more for one moral taught by the realities of the Boy Scout method than for one hundred morals dramatized by the gaesous vertebrates of fairydom. But, someone says, the children like the poetical and rhymes. Cannot the truth be made as poetical as the untruth?

The fairy story trains the imagination. If a little more than 50 years ago someone had told General Grant that some of his men would live to see the day when battles would be fought in the air and beneath the surface of the ocean he would have smiled incredulously. His imagination could not have conceived the things of the great war of today. These wonderful inventions of science are due to the imagination based on realities. Study the life of any of these great inventors and you will find them based on realities. When the imagination wanders about unrealities the real environment does not change. When imagination is based on reality it accomplishes things. And so it is with the child. His imagination should not be started on the unrealities of life but should be allowed to start from the higher plane of truth. This is what the child does when he uses the stick for a horse and the chair for a boat. Fairy stories are the inventions of adult imaginations forced upon the child and yet we inconsistently feel pleased when we can say that "he no longer believes in fairies."

Then the recapitulation argument. The literature of primitive man was folk-lore and the childhood of the individual should parallel the childhood of the race. The mother of the howling savage stilled her papoose with a folk-lore story. Does that excuse the modern (?) mother who awes her little one with "The boogy man will get you" or "I will shut you up in a *dark* closet?" That child

is to live in the future. He may have to perform some duty in the dark but lacks the courage because fiction has preceded fact. The Br'er Rabbit stories of Joel Chandler Harris are valuable records of the folk-lore of the African Americans. They were told by negro mammies to silence their picaninnies or to rouse them into delight. The triumph of these imaginations over fact in the mind of the negro has made him superstitious and awry. That method of child discipline is not necessary or desirable. Neither is it a prerequisite for raising rabbits. Folk-lore stories are illustrative of old methods and are rich in material for the mature student. I believe that they have no place in the primary grades and above all things should never precede the true story.

As the criticism of these readers may be thought to be severe, verbatim samples of their nonsense have been selected.

"*A little bee cried, 'Buzz, Buzz,' all the way home.*" The author was so impressed with the little pig and wee wee that the same style was extended to bees and other animals.

"*Can I pat the fat cat? Did the dog see the frog on a log?*" Here the writer is obsessed with the phonic idea at the expense of good sense. I am not an authority on the matter but have been taught that *can* means to be able or to be competent to do something.

"'*Why, why, why!' said Goosey Loosey.*" This reminds me of a friend who took great pleasure in using baby talk with his baby girl. He would say: "De boomps want wa wa!" Translation: Does baby want water? Cute? Yes. But, why waste time in learning two vocabularies? Why keep the little one in that early confused stage of acquiring words? The aim of the parent or teacher should be to help the child over complex places and not to prolong the period of difficulty.

> "*If all the world were apple pie,*
> *And all the sea were ink,*
> *And all the trees were bread and cheese,*
> *What should we have for drink.*"

Children read and listen to this foolishness while Hooverism is a vital part of our existence.

"*Once a cat ate a kid.*" Quite a fete-cham-petre for a cat.

"'*Little Mouse, will you have some milk?*' says Mrs. Cat." How modest as compared with the cat mentioned in the preceding quotation. Cats are not usually so considerate with mice.

"*Mrs. Tabby Gray told stories to ker kittens.*" She could also tell interesting stories to the person who can observe closely.

"*Help! Help!*" *he cried; "I am buried alive.*" This is said by a squash seed. A squash seed must be buried alive in order to grow into a healthy plant.

> *"Bees don't care about the snow*
> *I can tell you why that's so*
> *Once I caught a little bee*
> *Who was much too warm for me."*

Rather of a pointless point.

> *"And the milkweed laughed and laughed,*
> *It laughed so long that the pod burst."*

Some interesting truths about milkweed pods. Contrast, with milkweeds that laugh, for educational value. Each pod has a spring-like stem. When the wind blows the spring shakes the seeds out and they are blown away. As long as the pod is green and growing it cannot burst even though it laughed harder than ever. When the pod stops growing it begins to dry. It then shrinks and splits at the seam. The pod opens toward the outside of the plant instead of toward the stem. The seeds, therefore, are not apt to catch onto any part of the plant and they are ready to be taken in any direction. When the pod first opens its exposes the seed. As these seeds ripen the silk dries and becomes exposed to the wind. As the seeds are arranged on top of each other, like shingles, they are not distributed at one time. Some of the seeds thus have a greater chance of being distributed at a favorable time.

> *"The world is so full of a number of things,*
> *I'm sure we should all be as happy as kings."*

This has become ironical. School readers in the future should be 100 per cent democratic.

"*Quack, quack, quack!*" *said the little duck.*

This was on the day that it hatched. Little ducks do not *quack*.

"*But the Half-chick only laughed,*" *and said,—*"*I'm off to see the King.*" Ths sum and epitome of absurdity.

The pictures of first grade readers are fashioned after the style of the stories. Many include such pictures as: pig crying; kitten baking pie; hen wearing a thinking cap; wolf blowing a house down; a fairy pulling the seed coat off a squash seedling; kittens knitting mittens; duck with an umbrella; fly weeping;

pansy with a human face and wearing a dress. Another kind of picture, the one that is supposed to tell the truth and does not, is really the most mischievous. Fortunately there are not many of them. In one reader there is a story of the mother blue bird setting on her nest of eggs. On the opposite page is an excellent colored plate of the blue bird. The blueness of the picture shows it to be the male bird. The child naturally supposes that it is the mother bird. In another book the story of the ox finding the cross dog in the manger is illustrated by a good drawing of a cow and a dog. Some country children know that a cow is not an ox. Many first grade readers are beautifully illustrated and this is rather remarkable when we consider the very low price at which they are sold.

Suppose a child escaped the vicissitudes of a first grade reader, and acquired the vocabulary of an (un)ordinary young citizen. If suddenly ushered into the inner shrine of a first reader he would meet a foreign language which for our convenience may be classified as follows:

Strange animals: Magpie, roebuck, falcon, civet, vampire, unau, newt, ibex, dickey-birds, terrapin, yak, zebu, cockhorse, etc.

Unusual words: Slink, huffed, dillar, diddle, dickory, malt, whey, ply, tuffet, curds, elf, pease, etc.

Baby talk: Lammie, mousie, henny, goosie, etc.

Deceased (?) words: Lambkin, prig, ye, dame, ewe, etc.

Marvellous creations: A-riddle-ma-ro, chinchopper, cherri-o, jiggityjog, clumpety, higglety, pigglety, etc.

As reading is the main occupation of a first grader the verdict of a rigid course of study would be quick and merciless. The child with the vocabulary of ordinary folks must remain in the first grade.

Conclusions regarding first grade readers from the point of view of a naturalist:

1. True to nature stories are decidedly lacking in first grade readers.

2. Stories about the ordinary everyday doings of animals are missing in first grade readers.

3. First grade readers belittle the mind of the child by giving him foolish stories, a world of hobgoblins, void of thought.

4. True nature stories are interesting enough and do not need to be artificialized.

5. The fairy stories of the ordinary child primer are for the study of the mature student.

6. The true story should precede the myth.

7. The writers of first grade readers have the preconceived idea that the unreal is a necessary preparation for literature. This inherited custom hinders the writers from proceeding in a natural way and so they distort the mind of the child for months with the literary method of the savage. Should we keep the child on all fours to be sure that he passes through that stage? Education should help the child pass through these stages and is not a device to keep him in them.

Orion, The Mighty Hunter

W. P. ALEXANDER
Instructor in Apiculture in Cornell University

Orion, the three large stars in a line forming the belt, the curved line of smaller stars below forming the sword, Betelgeuse above, Rigel below at the right.

"Begirt with many a blazing star
Stood the great giant Algebar,
Orion, hunter of the beast!
His sword gleaming by his side
And on his arm the lion's hide
Scattered across the midnight air
The golden radiance of its hair."

Longfellow, when he wrote the above quoted verse which is from his beautiful poem "The Occulation of Orion" felt impelled to make an apology for he says elsewhere, speaking of its composition: "Astronomically, this title is incorrect. But my observation is made from the *hill of song* and not from that science; and will, I trust, be found sufficiently accurate for the purpose." One could hardly wish for a finer glimpse of the mighty hunter that we are about to discuss, than Longfellow has given us in his picturesque lines, unless perhaps it be an actual look at him, alone in his celestial magnificance on some crisp and frosty winter's night.

Orion is the unsurpassed master of our brilliant heavens in the cold months when all the visible constellations vie with one another in lavish scintillating. His belt is better known than any other

group of stars with the exception possibly of those that form the Big Dipper.

> "Those three great stars in the Giant's zone,
> That glitter burnished by the frosty dark."

It is a great pleasure to watch the movements of the stars. The children love to do so and often the interest beginning in a nursery rhyme has led to an ardent study of the sidereal heavens in later life. It is told that Tegner, the Swedish poet, when a child of only five once informed his father that he thought the stars were holes punched in the floor of heaven by God's walking stick, through which the celestial light shone. A remarkable and beautiful thought for so young a mind to construct. The stories that began far back in the history of the world, in which the stars, and constellations figured, lend a peculiar interest to the stellar world and should be taught and often repeated to the children in schools at an early age. With the exception of the Bear or Dipper, few of the constellations have been named for the young folks, and most of this world's denizens pass through life without the ability to name a single other, than this one star group. Manifestly this is wrong. Things so remote and yet so familiar to all of us as the stars should not go nameless.

Orion is plainly to be seen on any clear night from October to May. The first thing to catch our eye, if we but glance upward in these months is the great dazzling belt of three stars that marks the mid-regions of the giant. They have been called the Magi, or three wise men, also the Three Marys and the Yardstick, for they measure off just three degrees, or as we might say, a celestial yard. The four great stars that dot off the chief figure of Orion are remarkable for their splendor and brilliancy. These four are Betelguese, Rigel (also called Algebar), Bellatrix and Saiph. It is hardly to be wondered at, that the ancients saw in this colossal parallelogram the figure of the hero of a then popular myth; the belt and sword stars complete the likeness with surprising exactness, and leave but little to the imagination. With most of the constellations it is difficult to explain the names that have been applied to them, or rather it is impossible to clearly trace the figure indicated by the name, such as, for instance, that of the Archer, the Swan and Perseus: but in Orion this is not the case, for here almost without imagination we can see the Giant,

sword on belt, and club in hand, awaiting the rushing bull with Aldebaran for his fiery eye.

Of the stars that appear in Orion two are of the first magnitude and have a place that is unrivaled in a single constellation. They are Betelguese and Rigel, the one in the right shoulder of the Giant and the other in his left foot. Betelguese is old and his face is red; this, astronomers tell us, is an indication of decline, the gradual sinking into darkness which is the ultimate fate of all stars. Betelguese is a very beautiful object in his glow of dusky red, tinged with orange; this is a color that stars affect when they have reached the stellar years of discretion, and no longer scintillate in a mad riot of youthful exuberance and vivacity. Of course I would not have it understood that Betelguese does not twinkle and gleam, as becomes a star of the first magnitude, but he does so in an intermittent fashion, now equal in regal splendor to Altair and Aldebaran, and again relapses into a soberness, when he is no brighter than Formalhaut or Deneb. This is not the manner of Rigel, the magnificent companion of Betelguese in the same rank. Marking the left foot of Orion this stellar jewel flashes his brilliance through the night with unwavering and irrepressible vividness. Rigel is young and his glowing condition is but the pomp and circumstances that all youth glories in. Rigel is the brightest star in the figure of the great hunter, he is 16 degrees south of grand old Betelguese. "The celestial equator runs just about half way between the two stars so that Betelguese lies in the northern and Rigel in the southern hemisphere." When the constellation swings proudly into view, we first sight the somber red face of Betelguese, some twenty minutes later Rigel comes dancing sprightly into the field, shaking his flashing tresses with splendid dash and radiance.

Mythologically, Orion was the son of Neptune; the Greeks in their picturesque way made him a warrior-giant, and the greatest hunter in the world. Homer described him as "the tallest and most beautiful man;" but he was proud and boastful and made the vaunting claim that no beast on earth was so powerful but that he could stay it; whereupon Juno caused a great scorpion to sting him in the foot, and thus the mighty boaster met his death. Diana, later interceded with the Gods, who placed him in the sky where we now see him, "opposite to the Scorpion," so that he may take flight in the West forever when his enemy rears its loathsome head above the eastern horizon.

In his celestial position, however, Orion is none the less defiant, and still the hunter of the beast, for there he stands with club uplifted and arm swathed with the lion's skin ready to slay the mighty Bull, Taurus, who charging upon him, is bent on doing to death our steadfast, fearless hero. The whole makes a magnificent picture of heroic proportions.

The antiquity of the myth of Orion can better be comprehended perhaps, when it is stated that the constellation is called by that name, several times in the Bible; in the Book of Job in particular it is mentioned with the Dipper or the "Seven Stars" and the Pleiades. Amos, also made mention of Orion Ancient and Modern poetry makes many references to the hunter of the beast. Aratus tells how Orion "flies to the utmost end of the earth" when the Scorpion comes. Manilius wrote:

> "Near the twins behold Orion rise
> His arms extended measure half the skies,
> His stride no less."

This is a very splendid touch, betraying the mighty size of the imperishable hunter. Milton has some ringing lines, that are full of majesty in "Paradise Lost" on this subject; and in our time, Tennyson was tireless in his use of Orion to grace some of the finest music he has produced in his rich and flowing verse.

The stars of Orion's belt are familiar objects indeed, and as I stated before are better known perhaps than any other star group of the winter sky, with the exception of the Dipper. I wish to speak of the belt here in connection with the sword, for the two go together, and in the latter is found the great nebula which is as astronomers tell us, one of the most astonishingly beautiful things to be witnessed in the sky. The belt is made up of three brilliant stars of the second magnitude, so evenly spaced as to command our profound admiration. They are an excellent aid to us in finding the most majestic star of our northern latitudes, we have but to produce a straight line extending southward in the direction they lay, and it will meet the noble Dog Star that the Arabs called Al Shira, The Shining One. The fact too that Orion's belt stars measure just three degrees, is of much use to us, for by this heavenly ell, we can make many calculations among the stars with great ease. The curved line of stars depending from the belt of the giant form his sword, and while the stars that compose it are not remarkably brilliant, the third from the

bottom is really the great nebula that is commonly called the "fish-mouth." It has a fancied resemblance to some monster head. The nebula is hazy even to the naked eye. Six very fine stars that without the aid of a telescope appear as one, lie directly within the nebula: this gives some indication of the vastness of this incandescent mass. It is further interesting owing to the fact that these stars are known as Orion's trapezium from the position they take when seen through a powerful glass. Sir John Herschel in writing of the nebula, says that it appears as a mass of curdling liquid, and compares it "to the breaking up of a mackeral sky." In 1807 the wise men at Leipzig thought to spoil the great heroic figure of the heavens by taking the belt and sword stars and making them into a new constellation, Napoleon: we are glad that nothing came of this.

In closing it should be stated that the Greeks held Orion to be threatening and often hurled bitter invective at him. Many a classic ship or fleet of war galleys that came to grief in those olden days, met their fate because Orion frowned upon them; at least so thought the Ancients, hence the ugly language they used in speaking of him from time to time. But in spite of this Orion is today as he has ever been the glory of the winter's night, when stars are plain to see, and though we do not fear him today, we at least stand in awe of his supreme beauty and towering, gleaming majesty.

Starlight

LIBERTY HYDE BAILEY

I slept night long in the starlight
  Under the calm great sky
The cool of the depths was about me
  As the silent hours went by.

The day had been one of dejection
  It followed me on to my rest
And I took me out to the starlights
  When the day went down in the west.

Often I woke from my slumber
  And the silent stars were there
In passionless steadfast legions
  On guard in the welkin bare.

Under the gleam of the starshine
  Motionless long I lay
Knowing at last I had mastered,—
  As calm and as silent as they.

—From *Wind and Weather.*

The Beginning of Star Study

Anna Botsford Comstock

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The study of the stars has a great fascination for children but there have been difficulties attending the teaching of this study in the elementary schools. First of all, the teachers have found it impracticable to take their classes out at night. This difficulty, may be met by showing the forms of the constellations on the black-board, and by explaining in what part of the heavens they may be found at an early hour in the evening. February is a favorable time for beginning star study, for early in the evening Orion occupies the middle of the southern skies. The study should begin about the middle of the month when the darkness falls early.

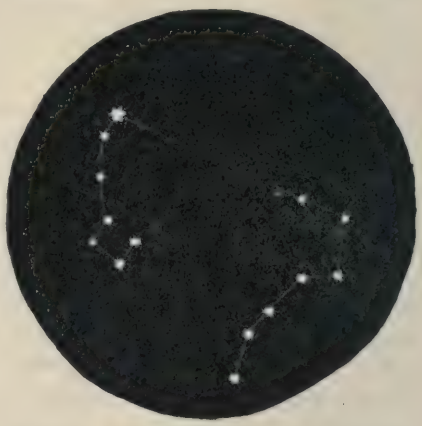

Diagram I. The Pole Star and the Big and Little Dippers

The first study should be of the Polar constellations. The Big Dipper and its relation to the Pole Star forms naturally the earliest lesson. Place the accompanying diagram (No. 1) on the board. If the lesson is given at the middle of February, the Dipper will be seen at seven in the evening low down in the eastern sky with the handle extending down toward the horizon. The teacher should have made the observation previously so as to be sure of the exact location. During the following two or three days questions should be asked concerning what the pupils have seen of the Dipper. The drawing should be erased from the board and each pupil should make a drawing for himself of the Dipper and the Pole Star as remembered. And this drawing should not be accepted until the proper number of stars are placed for the bowl and the handle and the proper relation of the pointers to the Pole Star are indicated. The following questions should be asked to stimulate further observations:

1. Look at the Big Dipper at 6:30 in the evening and again at 8 or 8:30. Does it keep the same position in relation to the Pole Star?

2. Is the Dipper moving up or down?

3. Do the pointers keep pointing toward the Pole Star?

4. Does the Dipper move around the Pole Star at night? If so, does it move in the same direction as the hands of the clock or in an opposite direction?

By answering these questions from observation, the pupils may be taught the following facts: The Big Dipper points with its "pointers" toward the Pole Star and to us seems to revolve around it each twenty-four hours, but this appearance is caused by the fact that we ourselves on the earth are revolving from west to east. It is a little more difficult to explain that

Diagram II.

because of the movement of the earth in its orbit the Big Dipper and all the other stars arrive at a certain point in our sky four minutes earlier each day or about two hours earlier each month. The explanation may seem difficult to the pupils but the facts they should observe for themselves.

The next lesson should be on Cassiopeia's Chair and the same plan should be followed. Place Diagram No. II on the board, showing that the stars are placed to form an irregular W. Explain that it lies on the opposite side of the Pole Star from the Dipper, but at about the same distance from it. After two or three clear nights the following should be given:

1. Make a diagram (No. II) of the Chair, the Pole Star and the Dipper, showing how they are placed in the sky.

2. Does the Chair move around the Pole Star as does the Big Dipper? Why did the ancients name this constellation Cassiopeia's Chair?

After this the Little Dipper may be shown in the same way. The diagram is so long and wandering of the constellation, called The Dragon, that it is rather difficult to teach it in this manner. However, since the two stars in the Dragon's tail lie near to the bowl of the Big Dipper and the Pole Star, perhaps the pupils may be able to work it out partially. However, it is not an especially important constellation.

Diagram III

Orion

B—Betelguese
R—Rigel
M—Belt
S—Sword

The next lesson may be given on Orion. The diagram III should be placed upon the board and proceed as before; the location of the constellation should be described, and the following observations should be called for:

1. How many stars in Orion's belt? How many in his sword? What is the color of the bright star above the belt? What is the name of this star? What is the color of the bright star at about equal distance below the belt? What is its name?

2. Read the story of the myths of Orion, the great hunter, and write an account of it.

After these studies have been made, the following questions should be asked:

1. Does the Big Dipper and Cassiopeia's Chair ever set?

2. Does Orion rise and set?

3. Why do not the Big Dipper and the Chair rise and set like Orion?

4. If you should stand at the North Pole where would the Pole Star appear in the skies?

5. If you were at the North Pole would any star seem to rise and set?

From this lesson the pupils should reason out for themselves the following facts. It is very important for us to know the Pole Star because the northern end of the earth's axis points toward it and it is, therefore, situated in the heavens almost directly above our North Pole. For those of us who live in the Northern Hemis-

phere the North Star never sets but is always to be seen. However, the North Star does not have any more to do with the axis of our earth than the figure on the blackboard has to do with the pointer; this star simply happens to lie in the direction toward which the northern end of the earth's axis points. In the southern skies there is no convenient star which lies directly above the South Pole, so there is no South Pole Star. The Pole Star cannot be seen from the Southern Hemisphere because of the curvature of the earth. But if we should start on a journey from Florida toward Baffin's Bay we should discover that each night the Pole Star would seem to be higher in the sky, and if we should succeed in reaching the North Pole, we should find the Pole Star directly over our heads. And none of the stars which we could see would rise or set but would move around us in circles parallel to the horizon.

Since the earth is a great magnet and since the poles of the magnet are almost coincident with the poles of the earth's axis the magnetic needle naturally points north and south. Thus it is that the North Star happens to be nearly in the direction toward which the northern end of the compass needle points.

In correlating the myths which have to do with the names of the constellations, the pupils should be made to understand that the ancients believed almost any kind of a story about their Gods. And since they saw these constellations in the skies night after night they naturally connected them with the stories of their Gods and Goddesses and thus gave them the names which we use to this day. Two interesting little books give these myths: "Storyland of the Stars" by Mary Pratt, American Book Company; "Stars in Song and Legend," Porter, Ginn and Company.

THE DISTANCE OF THE STARS

Although the stars are so far away from us we have learned many things about them, and after the pupils have become familiar with the Polar Constellations and Orion, as outlined in the preceeding lessons, it would be well to give them some idea of what a star really is. An informal talk should cover the following points:

The scientists have three ways of finding out about the stars, first, through the telescope, second, through the wonderful instrument, the spectroscope, which can only be understood after we study physics, and third, by mathematical calculations. Through

these agencies we know that every shining star is a great fiery sun, and we may well believe that many of these suns have worlds like our earth revolving about them, but a little world like ours we could not see if it were revolving about even the nearest star.

It is very hard for us to comprehend how far away from us is the nearest star, but astronomers have been able to measure the distance from us to many stars, and this distance is so great that it can only be reckoned at the rate at which light travels, which is 186,400 miles per second or about six trillions of miles per year and this distance is called a light-year. It requires light about eight minutes to reach our earth from the sun, but it requires more than four years for light to reach us from the nearest star. Most of the stars are so far away that we cannot measure the distance from them to us, but it is interesting to know that the light from the Pole Star which reaches our eyes in cloudless nights may have started on its journey almost fifty years ago, while the light that reaches us from the interesting little group of stars called the Pleiades, may have started on its journey before Columbus started on his great voyage.

The stars seem always to us to keep their own places in the heavens but they are all moving through space just as our sun and its family are doing. However, the stars are so far away that although one may move a million miles a day we would need to make observations upon it for years to detect that it had moved at all. We know that our sun and its planets are moving through space at the rate of about 800 miles per minute.

Stars also have their youth, middle age, and old age. When they are young they are composed of thin gases and shine white or blue; as they mature the gases condense and they shine yellow, like our sun; when the gases become still more condensed they shine red, like Betelgeuze in Orion, which is a very, very old star, and after a time, more years than we can even think about, these stars grow cold and dark and become invisible to us. The spectroscope shows us that there are many of these vast dead suns, with their fires out, whirling through space.

If any of us with especially good eyes were to travel from the Northern to the Southern Polar region, we should be able to see between six and seven thousand stars, although never more than about two thousand at one time. With the aid of the telescope about eight hundred thousand stars have been discovered. But

during recent years the skies have been photographed, and thus we have a record of about thirty million stars. We usually regard the Milky Way as a band of light across the heavens, but it is really made up of millions of stars so far away that we cannot see them at all. We can only see the light that comes from them.

Before the following lessons are given, the pupils should be instructed how to draw an imaginary line straight from one star to another and to perceive the angle which two lines make when they meet in a certain star. An ordinary ruler or what is even better, a postal card or other stiff paper with right angled corners, may be used by holding it between the eyes and the stars to be connected and thus make certain that the imaginary line is straight.

Place Diagram IV as given on the blackboard, but do not add the connecting lines until needed to enable the pupils to find the different stars to be studied. If possible let the blackboard stand so that its edge labelled "East" extends toward the east.

ALDEBARAN (AL-DEB-A-RAN) AND THE HYADES (HI-A-DEEZ)

Above Orion, and almost in a line with the stars of his belt, is a beautiful rosy star. It is as red as Betelgeuze and it forms the end of the lower arm of a V-shaped constellation composed of it and four other stars. This is Aldebaran and the constellation is called the Hyades. These form a part of the head of the constellation called by the ancients, Taurus, the Bull. Aldebaran is the fiery eye of the mad bull. This beautiful rosy Aldebaran is a comparatively near neighbor of ours, since it takes light only 32 years to pass from it to us. It is much larger than our sun for it gives off about 45 times as much light.

THE PLEIADES (PLEE-I-DEES)

Up in the western sky about as far beyond Aldebaran as Aldebaran is beyond the belt of Orion is a little misty group of stars which seem always to have attracted the attention of people during all the ages. This constellation is called the Pleiades. Most eyes are only sufficient strong to count six stars in this group. Through a glass nine stars may be distinguished. In studying this constellation we can realize better than in any other the wonder which photography have performed in revealing stars which we cannot

Diagram IV. Showing the relations to each other of The Big Dipper, Pleiades, Hyades, Capella, Twins, Orion—and the Dog Stars

see. Sky photography shows us that there are more than three thousand stars in this little constellation; and astronomers believe that it is a great star system now being developed. These stars which look so close together to us are so far apart that our own sun and all its planets could roll between them unnoticed. It requires several years for light to travel from one of these stars in the Pleiades to another, and the whole constellation is so far away from us that we cannot estimate the distance, but we know that it takes light several hundred years to reach us from them. The following questions should be asked:

How many stars can you see in the Pleiades?

How many stars can you see in the Hyades? Make a sketch of the Hyades showing Aldebaran.

THE TWO DOG STARS

Make a map of Orion on the board and extend the line X through the belt toward the horizon. This line will reach a very brilliant star, which is the Big Dog Star, Sirius. Then draw lines yy^1 joining Betelgeuse, Rigel, and Sirius and complete the kite-shaped figure by linsey y^2 y^3 which will meet in Procyon, The Little Dog Star. The following questions should be asked after the pupils have observed these two stars.

Which rises first, Orion or Sirius? What color is Sirius? Why is Sirius called the Big Dog Star?

Is the Little Dog Star nearer to the Pole Star than Sirius? Which is brighter, the Great Dog Star or the Little Dog Star?

Sirius is the most beautiful of the stars in our skies; it shines with ever changing color, blue, rosy and white. Sirius is a comparatively young star and has a diameter about 14 times as great as that of our own sun. It is eight and one-half light years away from us. Perhaps no star of our sky is so celebrated in ancient and modern literature as Sirius. Homer mentions it and it has had a place in the poetry of the ages. Procyon, The Little Dog Star, probably earned its name because it trots up the eastern sky just a little ahead of the Great Dog Star, quite like a little dog in its habits. It gives out eight times as much light as our own sun and is only ten light years away from us. Its companion or twin star, is not so brilliant.

Ask the pupils to join line m, drawn through the pointers of the Dipper to the Pole Star on another line m, at right angles to this

extending from the Pole Star to Rigel. About halfway between the Pole Star and Orion this line will pass through a brilliant star which is called Capella. The following questions may be asked: What color is Capella? How does this show that it is the same age as our sun? Is Capella as near the Pole Star as the Big Dipper? Is it near enough so that it never sets? Can you see the shield shaped constellation of five stars of which Capella is a part? What is the name of this constellation?

Capella comes very near belonging to the Polar constellation since it is below the horizon only about four hours out of the twenty-four. It is bright yellow which shows that it is about the same composition and age as our sun. However it gives off 120 times as much light as our sun. It is 40 light years away from us. During the evenings of March and April, in its shield-shaped constellation which is called Auriga it is a very noticeable feature high up in the western sky.

THE HEAVENLY TWINS

Above the Little Dog Star with its twin and in a region of the sky where there are very few bright stars are a pair of twin stars which are very noticeable. These stars will naturally be discovered when finding Capella. To this brilliant pair of stars the ancients gave the name of the twins, Castor and Pollux. These were two beautiful twin boys who loved each other so much that after they were dead they were placed in the skies where they could always be near each other. Pollux is the brighter of the two and is the more southward in situation. It is a yellow star and is supposed to be in the same stage of development as our sun, while Castor is white and is therefore, according to the ages of the stars is young. The following questions should be answered by the pupils from observation.

How can you tell the Heavenly Twins from the Little Dog Star and its companions? Which pair are the brightest in the sky? Which of the twins is the brightest star? For further study of the constellations use "Whittaker Planisphere" to find the stars see the "Friendly Stars" by Martin.

NOTICE

The Title page and Index for Vol. XIV of NATURE-STUDY REVIEW will be sent in the February number.

A Lesson on Fossils

Mary E. Hill
Kennebunk, Me.

This lesson is particularly valuable in regions where there are fossil bearing rocks, but it is by no means limited to them. Stones have a great attraction for children, whether from some atavic instinct inherited from the days when stones were the only weapons and the earliest tools or because they are so common and make pretty playthings. Whatever the reason, more stones have been brought to me by my pupils with requests for information than any other natural objects except insects.

The lesson was given by the writer in Central New York, in a city whose outskirts contained numerous limestone quarries and deposits of shale. The school museum contained specimens from other localities, sandstone and shales bearing imprints of leaves; limestone containing shells of brachiopods and a few trilobites.

"Stones" brought in by the children were part of the material for the Nature-Study lesson. The lesson as taught consisted of three parts. First the examining of the specimens of fossils and an explanation by the teacher of the way in which fossils were made; second the making of the fossil impressions in clay by the pupils as an illustration; and afterward a lesson on the part that corals have had in making additions to the original peninsula of Florida. This last may seem to some not very apropos but it seemed to me a valuable lesson and I chose to teach it in this correlation. The geography teacher was appreciative of this lesson.

The material for the lesson then will consist of: (1) Pieces of rock with fossils in them, limestones, shales, sandstone to be obtained from quarries or talus slopes. (2) Small empty seashells, pieces of coral, pillbugs sometimes called sowbugs, leaves of trees, willow, apple, birch, of ferns. The dried leaves of autumn make the best impressions.

(3) Outline maps of the United States and of Florida.

(4) Clay, modeling clay or clay from a brick-yard, or from a local deposit. (5) A smooth surface of glass or oil-cloth or anything. (6) Steel knives or smooth sticks of hard wood, for making the portions of clay smooth.

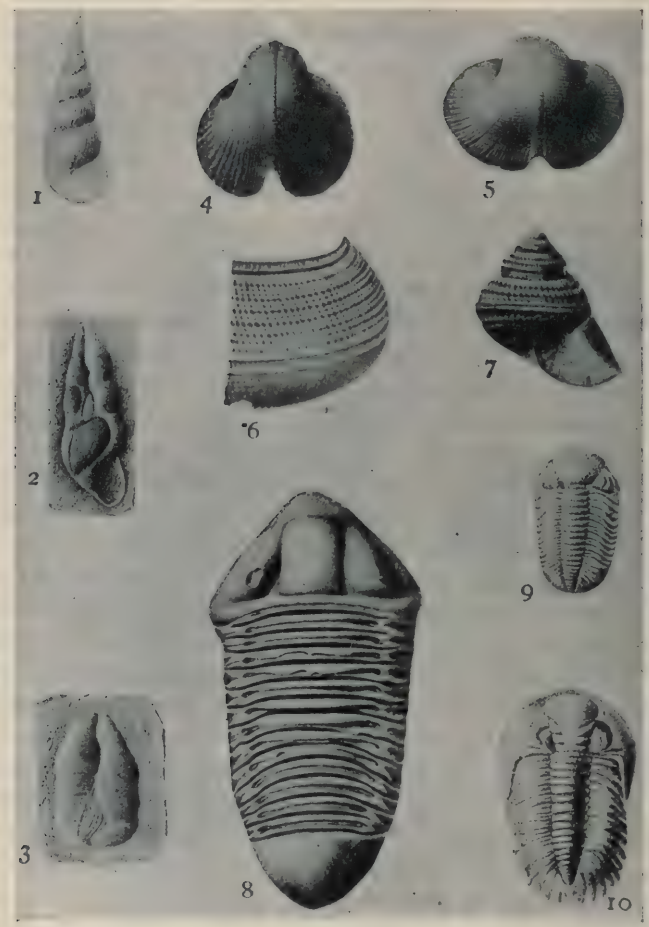

Plate I
Trilobites and other crustacean fossils
(Loaned by Prof. G. D. Harris)

In preparation the clay is placed in a pan or bucket or large jar and covered with a very wet cloth for twenty-four hours. Do not wring the water out of the cloth and do not put the clay in water. To make impression fossils, flatten out the piece of clay, making it about half an inch thick. Smooth off the top with the knife or wooden stick. This makes the surface of the clay smooth, like the surface of a mud flat by the sea, where shell fossils are made or near rivers where leaves fall or drift in and remain. Lay the leaves on the surface of the clay with the under side of the leaf next the clay (the under surface of the leaf makes a better impression than the upper, because the veins stand out more). Press upon it hard with the hand, or better with a piece of glass or board. Let the leaves remain on the clay and put away to dry. Of course in real fossils the leaf remains and traces of its substance may sometimes be detected with the impression.

In making shell impressions choose shells which have grooves or ridges in order that the impressions may not be smooth and characterless. Press the shell into the clay and then gently pry it out, unless it is a flat shell, or unless it is desired to represent the imbedded fossil which is a little less like the real because it is white. These clay fossils should also be put away to dry. If trilobite fossils are at hand compare with the pillbug, showing the segmented back, but noting the three areas on the trilobite and only one on the pillbug. A crayfish or lobster, though so much larger, will show the marks of relationship. If one of the trilobites is in a curled up position, by touching the pillbug it can be made to curl up in the same position which gave it its name, I suppose. Both trilobite and pillbug are crustaceans, relatives of the lobster, crayfish, shrimp and crab.

What a Fossil is

If we walk along the seashore and dig in the sand we find shells and remains of sea animals, that have been buried by sand, brought by the waves and high on the beach, drifted over by the winds. On a mud flat we find leaves, sticks and logs brought down by the river and deep in the mud, clams, worms and other animals, layer after layer of mud may cover them. If the beach and mud flat were to be raised and made into rock as earth forces have done in the past, these shells, leaves, etc., would become fossils.

Plate II
Fossil Corals
(Loaned by Prof. G. D. Harris)

In the warm seas of the tropics we see coral reefs and atolls of great depth. If we look through the queer tube with a glass window at the end that is sometimes furnished with boats at sea side resorts, we see the sea bottom covered with shells, corals, and strange sea animals. If these were to become buried under layers of mud or sand, they would die but their hard parts would remain nearly undamaged; sometimes the soft parts are preserved too, becoming hardened by the lime. Mud and sand are rock material and if they were to become solid rock, as mud and sand have become in past ages before man was, their remains would be fossils.

The remains of ancient plants and animals found in the rocks of quarries on outcropping ledges are fossils. Even the tracks of animals found in the rocks are fossils. Skeletons of animals found in not very perfect rock, are fossils also. There are some such rocks and fossils in the regions of the Wasatch Mountains in Utah.

How Fossils Have Made Land

At the time when this little fossil shell was the home of a living creature there were no men on the earth; no horses had galloped over the prairies; there were not even any prairies, only a few big islands in an ocean that covered the mud. So of course, there were no dogs, no foxes even, nor any cats, nor any birds singing in the trees. There was a big strip of land in what is now a part of British America. Over the bottom of this immense ocean grew great coral reefs; in its waters lived many kinds of sea animals; queer fishes swam there and giant shell bearing animals moved sluggishly on the sea-bottom, some having chambered shells like the Chambered Nautilius, some with straight shells ten feet long; there were trilobites too, ancestors of our lobsters, crabs and shrimps, star fishes and their relatives called by the geologists, who first studied and described them star lilies because they grew on stalks. Such of these animals as had lime in their shells or their skeletons, helped the coral to make the rocks that lie under the soil of much of New York State and in other parts of the United States.

After a long time, geologic ages, the crust of the earth in wrinkling slowly lifted some of the sea bottom, with its coral reefs and deposits of mud mixed with shell deposits, above the water and

that is why in limestone quarries, we often find the remains of shells and corals not destroyed nor much changed from the shapes they bore when they were part of the sea floor. The way in which the soil was made and spread over all the sea rocks is another story; but under all soil lies the solid rock, some of it called limestone made by the sea animals whose shells we call fossils, some of it is made in other ways and that is yet another story, but corals and mollusks helped.

Test limestone with acid and see the bubbles of carbondioxide gas set free from the stone. Test a shell and a piece of coral with the same acid and see the same gas freed; thus proving that the stone and the coral and the shell contain the same substance. But just how did the coral and the shells become solid rock, and why is not the rock white? As the cooling earth wrinkled, ridges with their slopes appeared above the water. At once the rock began to be weathered by the action of the air, rains washed off the powder thus formed and deposited it as soil. The waves broke off pieces of coral; some of the shell-protected animals died and their shells and the coral were ground against the rock, and a soft dark mud was formed against the edge of the land. Shells left by the tide on the surface of the mud became imbedded and were gradually covered by other layers of mud and coral sand and lay there many thousand years. The mud plain was finally raised by more earth wrinkling and become more dry land. Sometimes, in this wrinkling, land, that had been above the water. was again submerged and more corals and mollusks and crinoids and other rock makers lived and died and added their carbonate of lime "the coral" to the new rock layer.

What Corals Have Done for Florida

If we look at the map of Florida, we shall see that the Southern portion is occupied by the immense fresh water swamp dotted over with small islands, called "hummocks" covered with vegetation. This swampy region is known as the Everglades. South of the coast line are the Florida Keys which are believed to be the tops of coral islands, because south of these is a living coral reef. When the reef has grown up to the surface of the water the coral animals die and the reef remains a foundation to which are added pieces of broken coral, coral sand, drift wood, sea weed, sediment brought by the waves and so the keys are made.

The Gulf Stream helps in this land making by bringing sediment and debris which are caught and held by the reefs and which is deposited in the channel between the reef and the Keys. This will become a narrow channel with mud flats like that between the southern end of Florida and the Keys. The present channel will then become new Everglades and be added to the coast of Florida. Another proof that Florida has gained much of her land through the help of the corals is the fact that coral reef rock has been found as far north as St. Augustine. At least twice have Everglades been made and added to the land of the peninsula.

The steps in adding land, thus to Florida, are these: First, a reef is formed, by corals which build up the surface. Next, waves by leaving material which they carry, build it up twelve or fifteen feet above the water, and become keys. Third, mud and other material, form the peninsula on the north side and the reef, or keys on the South fill up the channed between the shore and new Everglades are formed. In this the mangrove trees help. A line drawn from St. Augustine to Tampa will represent the oldest reef formed. Another new coral reef has meantime begun to be formed farther to the south. Corals will not grow in muddy water, nor in water more than a hundred feet deep, nor in water that ever becomes cooler than 68 ° F.

It must be said that not all coral reefs add to the land in just this way, but they have done so in the case of Florida.

Leaf Fossils

The leaf fossils are not found in the limestone rocks, but in shales which are just mud and clay which have been hardened into rock. Mud flats were formed where rivers emptied into the sea and along rivers grew trees and other plants just as now. Their leaves fell into the streams and drifted down to the mud flats and probably some grew near the flats. Mud is fine material brought down by rivers as any of you can prove by dipping up a tumbler full of water when the stream is in flood, as in spring, or after a great rain and watching the mud settle to the bottom. So little by little the leaves became covered by more mud and there rested until the mud became shale, and the leaf fossils remain in the shale to tell us what sort of plants grew in these ancient times.

The long story of life upon the earth is a fascinating one. Sometime if you study geology you will know all about it.

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Editorial

THE COMFORT OF THE STARS

"Canst thou bind the sweet influences of the Pleiades or loose the bands of Orion?"—JOB.

Long before the time of Job and continuing to the present year of War and Peace the sweet influences of the Pleiades, unbound and unlimited, have made calm the souls of men who have looked up into the night skies and have thus learned to forget the troubles which beset the dwellers upon this small planet we call "the earth." It is unfortunate that more people have not learned to look up and think: "I am one of millions of beings inhabiting this world; and this world is only a small satellite whirling around a medium sized star, which we call our sun and which in its turn is only one of a million stars shining upon us from our skies. Not one star among all that I can see but may have worlds like ours whirling around it. What am I that I should be troubled when I am only such an infinitesimal atom in so great a Universe!"

However, it is not for this reason alone that teachers and parents should give more attention to teaching the children to know the stars as marked in the chief constellations; for such knowledge is an intellectual and spiritual asset which will enrich their future years. It lends a most friendly aspect to the night skies to find there, when we look up, those stars which we have known from childhood. Especially when we are in foreign lands, or elsewhere far from home, is this a heart-warming experience. It is as if the heavens were smiling at us and sending down to us cordial greetings.

The stars make appeal to the imagination of the child,—an appeal at once stimulating and uplifting. In his mind, he leaps

the bounds of space and goes visiting those suns which he calls stars and which twinkle at him so enticingly. It widens his powers of conception to know that the light that reaches him from the Pole Star may have started on its journey to his eye before his father was born; or that the light from Rigel, the brilliant white star that marks Orion's foot, was sent forth before Columbus discovered America; or that the very nearest star neighbor is two hundred and eighty thousand times as far from this world as is our sun.

It is indeed most salutary discipline to learn as early as may be, that our world and our particular section of it,, may not be the center of God's great universe.

The Great Dipper

HENRY WARE

With what a stately and majestic step
That glorious constellation of the North
Treads its eternal circle, going forth
Its princely way amongst the stars in slow
And silent brightness! Mighty One, all hail!
The other tribes forsake their midnight track
And rest their weary orbs beneath the wave;
But thou dost never close thy burning eyes,
Nor stay thy steadfast step. But on, still on,
While systems change, and suns retire, and worlds
Slumber and wake, thy ceaseless march proceeds.

No Annual Meeting of the American Nature-Study Society This Year

The war was still dragging down our hearts and our purses when the time came to decide whether we should meet with the A.A.A.S. in Baltimore this year. It seemed to be the patriotic duty of all of us to stay at home and help conservation and not go to Baltimore and help clog transportation. If the Nature-Study Society wishes to elect other or more officers, the secretary will be glad to receive nominations and place them before the members in the January number of THE REVIEW. The officers to be elected are: President, five Vice-Presidents, four Directors and Secretary-Editor.

News Notes

AFRICA

Stephen Rich, a former student in entomology, at Cornell University, writes that on leaving Ithaca in 1915 he accepted a position as introducer of Nature-Study into the native educational system, at Amanzintoti, Natal, in a training school to prepare Zulus to teach primary schools among their own people. He made out a course of study applicable to native plants and animals and taught Nature-Study in every class in school. After the first year Nature-Study was taken up by three other training schools and he prepared a more advanced course of study.

Later Mr. Rich went to Edendale as headmaster in another school of training for native teachers. All the training schools in Natal have now taken up Nature-Study and as the most experienced in teaching that subject Mr. Rich is consulted by all; he says that the Zulus are slow but very intelligent.

CALIFORNIA

O. J. Kern, Assistant Professor Agricultural Education in University of California, College of Agriculture, has published a course for teachers in Agriculture, Nature-Study and School Garden which is extensive and practical as well as inspiring.

This outline deals, first with the place of the school garden in a well organized scheme of agricultural education, (a) as a practical project in the art of agriculture, (b) as a laboratory or observation plot of elementary facts, (c) as a means of teaching landscape art. Secondly, it deals with the essential of a successful school garden. Thirdly, with tools needed for working the garden, the care of tools and contains lists of reference books on such tools.

The different chapters cover the following topics: Choosing the garden site; improving the soil, (a) references on soil improvement, (b) improvement of different kinds of soil,

Planning the garden, different garden systems, (a) co-operation in the work of teachers and pupils, (b) administrative problems to be decided by the teacher alone, (c) teachers' pedagogic problems (d) references to literature on planning school gardens.

Preparation of the seed bed, references on tillage of preparation. Planting rules and tables. The garden and vacations. Growing plants indoors, transplanting, references. Cultivation and irrigation, references. The garden and vacations, co-operation, exhibits. The garden and correlation of school work, references. Studies in vegetable characteristics and cultural requirements, outlines and references, outlines for garden vegetable growing.

Plant studies in connection with the garden, references. Soil studies in animal life. (a) enemies of the garden, (b) friends of the garden, (c) sprays, reference literature.

School gardens and landscape art, (a) educational influences of environment (b) good landscape and art, (c) civic art and community ownership and responsibility, (d) development of civic sense of need of landscape art, styles of planting, (e) district school in provement society, (f) observance of Arbor Day.

(g) illustrations of school ground improvement, (h) methods of transplanting trees and shrubs, (i) care after planting, (j) effect of landscape art on the home.

Some planting material, lists of hardy shrubs and vines. The rest of the book is devoted to diagrams of different garden plans, which consider economy of space, the kinds of vegetables to grow, the number of children at work, the best methods of planting to be used; points on soil preparation with illustrations, pictures illustrating different garden operations, such as the proper handling of fork, rake and by children at work.

The Extension Service of Humboldt State Normal School, Arcata, California, under the direction of N. B. Van Matre has begun an active and extensive plan of supervision of the rural schools of northwestern California. One hundred seventy-two schools will be supervised by the faculty of the normal school.

Two plans of supervision will be used, differing only in the degree of their intensity.

This rural supervision work is being taken up with very definite plans and purposes in mind and with equally definite ideas of the results to be obtained.

Some of these results will be accomplished by the supervision.

1. Every effort will be made to keep away from the thought of standardization.

2. The slogan for this work will be SERVICE, SERVICE, MORE SERVICE AND BETTER SERVICE.

3. Serve: Teacher, School, Trustees, Community, Elementary Education, America.

4. To establish a strong spirit of co-operation and a keener sense of responsibility on the part of the school trustees and the residents of the district in the success of their school.

5. To establish the fact that for a community proposition to succeed each member of the community must contribute to its success, and assume his share of the responsibility.

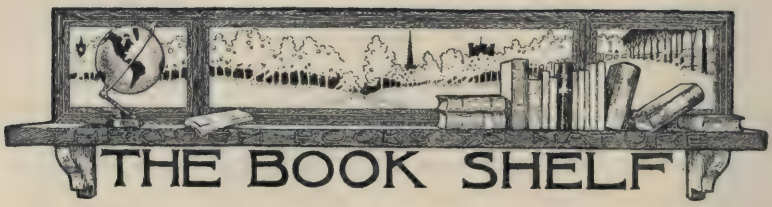
6. To educate the children for rural life rather than away from it.

7. To thoroughly inspire every teacher with an enthusiasm for or at least put her in such sympathetic relationship with her environment, that she can conscientiously do her *Full* duty by the children in her school.

8. Suggestions, helps and constructive criticisms will be given directly to the teacher by the supervisor at the time of the visit.

9. A very definite, concise report will be made to the normal school by the supervisor. These reports will be made in duplicate so that the supervisor may retain a copy which will be of great advantage on all subsequent visits.

10. To establish the fact that the individual lesson is only a means to an end. That education, growth and strength are the direct results of self-activity. Therefore, the cause, purpose and plan of each lesson should so motivate the child as to bring the desired self-activity.



The Waterboys and Their Cousins. Charles Dickens Lewis, Professor in Berea College, Normal School, J. B. Lippincott Co. 172 pp. illustrated.

It is with special interest and pleasure that we have read this volume for children; for these fascinating Waterboys are old friends of ours. Professor Lewis published a few of their adventures in a pamphlet a few years since and favored us with a copy which has been very much prized ever since and very often used. The activities of water in all its multifarious forms are dramatized in stories which have the quality of being very interesting. The Waterboys are the water molecules, dancing while they work and always happy whether they are climbing up a sunbeam or rolling down a hill. How they change from dewdrops to raindrops and to snowflakes, how they work in the ground, how they carry the soil and how they deposit it, how they climb up in the cornstalk, and how they help the "root children" get drinks and how they climb back into the clouds, each constitutes a story by itself.

While the adventures of the Waterboys make the most original part of the volume, there are many other nature stories that follow. The bacteria on the roots of clover, the work of the chlorophyl in the tissues of the leaf, the action of frost on the leaves, why the beans climb and all sorts of travels of seed babies and finally the story of the "Plants that never were babies" which describes the early stages of the ferns and mosses, the story of Mother Cornstalk and the Seed Ear, these and many others make this little volume a mine of information for children. An appendix contains explanatory notes for the teacher or parent. There are thirty charming illustrations by E. H. Suydam. We predict a large sale for this book for it is sure to prove a very important and delightful addition to the children's book shelf.

New Creations in Plant Life. W. S. Harwood, second edition revised and enlarged, 430 pages, illustrated. The Macmillan Company, $2.00.

This interesting volume is an authoritative account of the life and work of Luther Burbank. As one follows the fortunes of Luther Burbank, as detailed in the first chapter, one is carried away by sympathy for this man in his struggles with privations and filled with admiration for the type of character delineated.

From cover to cover of this book the truth is stranger than fiction, and the interest felt is absorbing. The reader is impressed with vivid glimpses of a personality, whose paramount object, always overshadowing all else, was to give aid to the human race.

His aims were: (1) The improvement of old varieties of fruits, flowers, grasses, trees, and vegetables. (2) The merging of wild or degenerate types of plant life with tame or cultivated ones, in order that the union might be of service to both. (3) The creation of absolutely new forms of life, unknown to the world before,—the highest act of the plant breeder.

The general character of Luther Burbank's work is included under two heads: (1) Breeding, (2) Selection. His work differs from all other experiments of this nature in the magnitude of the scale on which it is carried on, thus he has accomplished the wonderful results which are narrated in the later chapters of the book.

The account of the creation of new trees especially the new types of walnuts which in fourteen years grew six times as large as the old types had in thirty years, attaining a height of eighty feet with trunks two feet in diameter, while the grain remains hard, fine and compact, and takes a high polish, seems incredible.

The description of the transformation of the amaryllis and the poppy plants, are paralleled by work done on lilies and the production of the Shasta Daisy; and strangest of all seems the production from the Everlasting of a commercial flower suitable for millinery purposes. His improvement of the potato, experiments with it and the tomato and the development of a new fruit the pomato are all described in a most interesting manner.

Chief among the wonders recounted in this volume is the story of Mr. Burbank's work on the cactus by which he expects to regenerate the earth's waste places, and provide a new food for the world, for the new thornless opuntias yield food that is palatable and nutrious for man and beast.

Space is also devoted to his work with all varieties of berries and fruit trees; the methods of breeding, grafting, commercial aspects of the work are also described. A good description of Mr. Burbank's daily life, his personality, his theories and conclusions, and his methods of keeping data, are included in this truly interesting volume.

L. S. T.

The Teaching of Agriculture. Aretas W. Nolan, 277 pages, Houghton Mifflin & Co. $1.30. Introduction by Eugene Davenport, Dean of the College of Agriculture and Director of the Agricultural Experiment Station, University of Illinois.

To teachers of nature-study or agriculture, whether in the grades or in high school, this book should prove interesting and very helpful. In his preface the author says: "Agriculture in the public schools should have a decided vocational aim. It should give to the student a degree of accurate knowledge and skill and familiarity with the best modern farm practice. Agricultural education should guarantee that the future farmers be educated country gentlemen who work with their hands, and gather about them the best things that civilization affords."

Because nature-study purposes to give the boy and girl in the earlier grades of public school, that acquaintance with and interest in the natural world which will furnish a basis for further study of the pure and applied sciences, the author advocates beginning this study in the first grade, to give a general

acquaintance with common things; he advises combining it with home geography in the third and fourth grades; and in the fifth and sixth grades making it a kind of general science training. Beginning with the seventh grade agriculture should be taught as a vocational subject, as intensively and extensively as the capabilities of the pupil and the training of the teacher render possible. Methods and topics are suggested.

Passing on to high school agriculture, the principal aims should be vocational, to contribute to the practical education of the future farmer. One fourth of the students' time in school should be given to this topic and the author thinks it would be desirable that agricultural work be included in a unified science course. For junior and senior high schools are suggested (1) Agronomy, (2) Animal Husbandry, (3) The Farm Physical Plant, (4) Horticulture, (5) Improvement of Plants and Animals, (6) Rural Life and Affairs. A list of special study topics follows, with reference text books on general agriculture and an anthology of agriculture.

The different methods and principles used in teaching agriculture are mentioned and discussed: Such as the use of text-books, the lecture method, recitation and reports by students, laboratory methods experiments and the use of illustrations. Especial attention is given to the question of teaching Farm Craft and the manner in which the state of Illinois is handling the subject.

Another topic The Home Project Plan is treated very completely. The author suggests supervision of the regular farm work as an integral part of the school course as a solution of the problem and gives a list of suggestions for home enterprises along different lines of farming. The pages devoted to the objects of agricultural extension work in the high school and four different methods of approach to this work are full of suggestions. Then follows a pithy chapter on the most important factor in education, The Teacher of Agriculture.

Nearly 100 pages of this book are devoted to an appendix which contains suggestions for a farm, home, and community survey: For a suggested course in nature-study for each grade, with subjects adapted to the seasons of the year and sample lesson plans, for from first to sixth grade. For a suggested course in agriculture (the elements) for the seventh and eighth grades combined using the text-book method.

It contains a list of study topics adapted to the seasons, and a list of practical tasks of home work on the farm, that could be used for school credit in agriculture, also an outline of the Home Project Plan, There are also suggestions for laboratory equipment, and suggestions for a high school agricultural laboratory. Finally, a complete bibliography is given.

L. S. T.

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